Lumenis CO_2 Solutions for Gynecology

Bibliography of Published Studies & Peer-Reviewed Papers

The use of CO_2 Laser in surgical procedures in gynecology is clinically-based, and is used successfully in laparoscopy and other surgical approaches.
CO_2 Laser is a valuable tool in the treatment of several pathologies, as endometriosis, uterine fibroids, gynecological neoplasias and benign pathologies of the female lower genital tract, e.g. Bartholin's gland.
The following list presents selected publications from the last years, pointing out the advantages of using CO_2 laser for various applications in gynecology.

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Lumenis®
Energy to Healthcare

Energy to Healthcare

1990

Introduced
› UltraPulse® CO_2 and VersaPulse® Holmium laser systems
› patented WaveGuide delivery system for CO_2 laser

1996

Introduced VersaPulse® C

2000

Introduced VersaPulse® PowerSuite™, world's first 100W Holmium laser for BPH

2009

Introduced
AcuPulse™ with SurgiTouch

2010

Introduced
VersaPulse P20

2012

Introduced
AcuPulse WaveGuide

2012

Introduced
› AcuPulse DUO
› FiberLase Robotic DIG
› MicroLase Fiber
› FiberLase GYN Handpieces

2014

Introduced
› Lumenis Pulse 120H
› Xpeeda Fiber
› SlimLine 200 D/F/L Fiber

2015

Introduced
› UltraPulse DUO
› Lumenis Pulse 100H
› Lumenis Pulse 50H

2016

Introduced
› Lumenis Pulse 30H
› Suction hand-piece
› Otolase Fiber Delivery System

A Heritage of Innovation

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CO_2 Laser in Gynecology - an Overview

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
Laser technology and applications in gynaecology	J Obstet Gynaecol,33(3): 225-31	Adelman MR, Tsai LJ, Tangchitnob EP, Kahn BS	2013	› Gas and solid-state lasers are frequently used in surgical applications. CO_2 laser is one of the most common examples of gas lasers utilized in gynecological surgery › CO_2 laser is considered to be the most versatile, safe,and easily delivered for endoscopic use, serving as a cutting and coagulating instrument with minimal destruction of adjacent tissues › Laser technology provides alternative methods for treating various conditions in gynecology with minimal destruction of adjacent tissues	N/A
Fiber-Optic Technologies in Laser-Based Therapeutics: Threads for a Cure	Curr Pharm Biotechno, 11(4):384-97.	Wang Z, Chocat N	2010	› Until recently, CO_2 laser surgery, renowned for its precision and efficiency, was limited to open surgeries by the lack of delivery fibers › The advanced fibers are assessed for their ability to transmit CO_2 laser at adequate power level and for their applications in a range of clinical areas › The combination of new CO_2 fiber technology with the CO_2 unique features can reduce unnecessary damage to collateral tissues and coagulation of small blood vessels in order to reduce bleeding during procedure	N/A

Endometriosis

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
Treatment efficacy for pain complaints in women with endometriosis of the lesser pelvis after laparoscopic electroablation vs. CO_2 laser ablation	Lasers Med Sci ;30(1):147-52	Posadzka E, Jach R, Pityński K, Jablonski MJ	2015	› Evaluation of the efficacy of laparoscopic treatment with the use of CO_2 laser ablation versus electro-ablation with regards to pain complaints in 48 women in 2 groups › The Numeric Rating Scale (NRS) for pain intensity was reduced in both groups after 3 months. 6 months postoperatively, a statistically significant increase in pain intensity was noted in both groups › Both CO_2 laser ablation and electro-ablation seem to be effective in the treatment of endometriosis-related dysmenorrhea, whereas the intensity of other pain complaints has remained on the same level	Lumenis laser system
The laparoscopic management of endometriosis in patients with pelvic pain	Obstet Gynecol Clin North Am ;41(3):371-83	Yeung P Jr	2014	› Laparoscopic surgery has a clear, established role in the diagnosis and treatment of endometriosis of pelvic pain and infertility. › Excision surgery can be used to treat the disease more comprehensively than ablation technique › With the free-beam CO_2 laser, higher power (in the range of 12–15 W) can increase the precision of the laser as a cutting instrument	N/A

Endometriosis

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
Greater surgical precision of a flexible carbon dioxide laser fiber compared to monopolar electrosurgery in porcine myometrium	J Minim Invasive Gynecol, 21(6):1103-9	Bailey AP, Lancerotto L, Gridley C, Orgill DP, Nguyen H, Pescarini E, Lago G, Gargiulo AR	2014	› Comparing the surgical precision of a flexible CO_2 laser fiber with that of monopolar electrosurgery in 6 live adult non-pregnant female pigs › Incision width and depth of the laser were significantly less than monopolar cut at most power settings, as well as less collateral thermal damage width and higher efficiency of the laser compared with monopolar coagulation › CO_2 laser energy delivered via a flexible fiber system would exhibit greater surgical precision than monopolar electrosurgery, in both cutting and coagulation modes	Lumenis laser system
Video-assisted laparoscopy for the detection and diagnosis of endometriosis: safety, reliability, and invasiveness	Int J Womens Health ;4:383-93	Schipper E, Nezhat C	2012	› Review of laparoscopic diagnosis of endometriosis from the pre-operative evaluation during the surgical technique and postsurgical care of patients suspected of having endometriosis › Safe laparoscopic excision of an endometriotic lesion requires acute awareness of surrounding structures, and it is often necessary to cut adhesions in order to have a thorough evaluation of the pelvis › In dense adhesions, the CO_2 laser is preferred due to its limited thermal spread and precise invasion	N/A

Endometriosis

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
Laparoscopic management of endometriomas using a combined technique of excisional (cystectomy) and ablative surgery	Fertil Steril, 94(1):28-32	Donnez J, Lousse JC, Jadoul P, Donnez O, Squifflet J	2010	› Presentation and evaluation of a new technique of 2-step laparoscopic treatment of endometriomas that combines excisional and CO_2 laser ablative surgery in 52 patients › The pregnancy rate was 41% at a follow-up time of 8.3 months. Recurrence of a small endometrioma was observed in only 1 case (2%) › The combined technique (stripping and ablation) has proved not to be deleterious to the ovary, and takes the best elements from both techniques, while avoiding the risks	Lumenis laser system
The impact on ovarian reserve after laparoscopic ovarian cystectomy versus three-stage management in patients with endometriomas: a prospective randomized study	Fertil Steril, 94(1):71-7	Tsolakidis D, Pados G, Vavilis D, Athanatos D, Tsalikis T, Giannakou A, Tarlatzis BC	2010	› Investigation of the effect of two different laparoscopic methods on ovarian reserve in patients with ovarian endometriomas in 20 patients in 2 groups: laparoscopic cystectomy for endometrioma (group 1) or the “three-step procedure” which consists of laparoscopic cyst drainage followed by hormone treatment and a laparoscopic CO_2 vaporization (group 2) › Mean of Anti-Mullerian Hormone (AMH) levels in serum was significantly reduced from 3.9 to 2.9 ng/mL in group 1 compared with the reduction from 4.5 to 3.99 ng/mL in group 2 › Ovarian reserve determined by AMH levels in serum is less diminished after the “three-step procedure” compared with cystectomy of endometriomas	Lumenis laser system

Endometriosis

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
Outcome after multidisciplinary CO_2 laser laparoscopic excision of deep infiltrating colorectal endometriosis	Reprod Biomed Online ;18(2):282-9	Meuleman C, D'Hoore A, Van Cleynenbreugel B, Beks N, D'Hooghe T	2009	› Evaluation of clinical outcome after using a multidisciplinary CO_2 laser laparoscopic excision of deep endometriosis in 56 patients › Gynaecological pain, Quality of Life (QOL) and sexual activity improved significantly during 29 months after surgery. Direct complications from surgery occured in only 5%. 4 years after surgery, recurrence rate was 7%, and pregnancy rate was 70% › Multidisciplinary CO_2 laser laparoscopic excision of deep endometriosis with colorectal extension improves pain, quality of life and sexuality with high fertility and low complication and recurrence rates	Lumenis laser system
Laparoscopic management of ovarian endometriomas: a critical review of current practice	Curr Opin Obstet Gynecol, 12(4):309-15	Jones KD, Sutton CJ	2000	› Identifying the evidence from published literature for the laparoscopic management of ovarian endometriomas. › Laparoscopic surgery is equivalent to laparotomy. The operation of choice is still unresolved whichever outcome measure is used to assess efficacy › The best results from ablative techniques are achieved using a CO_2 laser as part of a two-stage procedure combined with adjuvant analogue therapy	N/A

Gynecological Neoplasias

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
CO_2 laser treatment for Vaginal Intraepithelial Neoplasia, assessment of recurrence	J Gynecol Res Obstet 2(1): 17-20	García-Iglesias Á, García-Sánchez Á, Moslemi I, Beltrán-Vaquero D, Alonso-Reyero MP, Rodriguez-Bravo T	2016	› Retrospective assessment of the response and evolution of vaginal intraepithelial neoplasia (VAIN) after CO_2 laser treatment in 139 women › The risk factors for recurrence were age over 45 years, type of VAIN and Human papillomavirus (HPV) type 16 infection. The lesion with more recurrence was VAIN III, with 15.26% › CO_2 laser vaporization technique is effective in treatment of Vaginal intraepithelial neoplasia (VAIN)	Lumenis laser system
Therapeutic effect of laser vaporization for vaginal intraepithelial neoplasia following hysterectomy due to premalignant and malignant lesions	J Obstet Gynaecol Res ,40(6):1740-7	Wang Y, Kong WM, Wu YM, Wang JD, Zhang WY	2014	› Retrospective evaluation of the therapeutic effect and recurrence of disease following laser vaporization for vaginal intraepithelial neoplasia (VAIN) after hysterectomy in 28 women in 2 groups › All VAIN patients achieved remission after 2 episodes of laser treatment, with 85.7% complete regression in group 1 and 54.5% in group 2. All patients had no recurrence during a mean follow-up time of 25 months. Laser treatments were well tolerated with no major side-effects › CO_2 Laser vaporization may be a useful option for the treatment of VAIN after hysterectomy	N/A

Gynecological Neoplasias

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
The efficacy of long term follow-up and CO_2 laser conization as conservative management in patients with cervical cancer stage FIGO IA1	Gynecology, 1:3	Fallani MG, Pieralli A, Lozza V, Tarani S, Bianchi C, Peyrov Sajad SS, Fambrini M, Penna C	2013	› Evaluating the efficacy of CO_2 laser excision as a therapeutical method for stage IA1 cervical squamous carcinoma in 60 patients › Conservative management with laser therapy was effective in more than 90% of the patients. When disease persistence was detected (7%), patients underwent repeated laser CO_2 conization and followed-up without demolitive intervention › Laser CO_2 conization alone appeared to be an effective and safe treatment for patients with cervical cancer. Careful post-treatment follow-up should be guaranteed	Lumenis laser system
Use of CO_2 laser vaporization for the treatment of high-grade vaginal intraepithelial neoplasia	J Low Genit Tract Dis., 17(1):23-7	Perrotta M, Marchitelli CE, Velazco AF, Tauscher P, Lopez G, Peremateu MS	2013	› Analyzing the clinicopathologic characteristics, diagnostic methodology, and therapeutic results obtained with the use of CO_2 laser vaporization for high-grade vaginal intraepithelial neoplasia (VAIN) in 21 patients › 18 subjects were disease free after a single application of CO_2 laser vaporization (cure rate of 86%). 3 patients (14%) presented with persistence/recurrence and required a second application › CO_2 laser vaporization was effective for the initial treatment of high-grade VAIN. However, a long-term follow-up is required due to the recurrent character of this disease	Lumenis laser system

Gynecological Neoplasias

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
CO_2 laser cylindrical excision or standard re-conization for persistent-recurrent high-grade cervical intraepithelial neoplasia (HG-CIN) in women of fertile age	Anticancer Res, 28(6B):3871-5	Fambrini M, Penna C, Pieralli A, Fallani MG, Andersson KL, Lozza V, Scarselli G, Marchionni M	2008	› Investigating the therapeutic efficacy of cylindrical or cone-shaped laser CO_2 excision in the conservative management of persistent-recurrent high-grade cervical intraepithelial neoplasia (HG-CIN) in 94 women of fertile age › The overall cure rate after a follow-up time of 54 months was 91.5%. A third excisional procedure was performed in 8 cases of persistent-recurrent HG-CIN with a disease-free subsequent follow-up of 38 months › CO_2 laser cylindrical or conical re-excision performed according to the time of reappearance of the disease seems to be a promising conservative approach for persistent-recurrent HG-CIN	N/A
Laser CO_2 conization: a safe mode of treating conservatively microinvasive carcinoma of the uterine cervix	Eur J Obstet Gynecol Reprod Biol, 15;113(2):229-33	Diakomanolis E, Haidopoulos D, Rodolakis A, Vlachos G, Stefanidis K, Komisopoulos K, Michalas S	2004	› Evaluation of the outcome of conservative treatment by CO_2 laser conization, for the management of microinvasive carcinoma of the uterine cervix (MIC) in 90 women › From the patients that underwent conization, 2 patients (2.5%) were detected with lymph-vascular space invasion (LVSI). 5 patients (7%) were found to have involved margins and from those, the majority was managed by a second conization. 4 patients (6.6%) with recurrence were observed during follow-up of 54 months, all of them with low-grade squamous intraepithelial lesion (LSIL). No cases of invasive disease or high-grade squamous intraepithelial lesion (HSIL) were encountered › CO_2 Laser conization is a safe and effective mode of treatment for women suffering from MIC and wish to retain their fertility	Lumenis laser system

Gynecological Neoplasias

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
Laser CO_2 vaporization for high-grade cervical intraepithelial neoplasia: a long-term follow-up series	Gynecol Oncol, 91(1):130-3	Fallani MG, Penna C, Fambrini M, Marchionni M	2003	› Retrospective evaluation of the effectiveness of CO_2 laser vaporization for conservative treatment of ectocervical high-grade cervical intraepithelial neoplasia (CIN) in 159 patients › The cure rate for a single treatment was 97.5% and a satisfactory colposcopic follow-up was possible in 99.4% of treated patients › CO_2 laser vaporization represents a safe alternative for conization in the treatment of high-grade CIN. Colposcopic expertise is essential for adequate preoperative selection of cases	Lumenis laser system

Uterine Fibroids (Myomas)

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
Flexible Carbon Dioxide Laser Fiber Versus Ultrasonic Scalpel in Robot-Assisted Laparoscopic Myomectomy	J Minim Invasive Gynecol ;22(7):1183-90	Choussein S, Srouji SS, Farland LV, Gargiulo AR	2015	› Comparing the effectiveness and safety of a flexible CO_2 laser fiber to the ultrasonic scalpel when employed through a robotic surgical system in 236 women in 2 groups › Estimated blood loss and operative time were comparable between the 2 groups, whereas length of hospital stay was significantly shorter in CO_2 group. No difference in the risk for complications was found between the 2 groups › Robot-assisted laparoscopic myomectomy with a flexible CO_2 laser fiber is safe and has comparable operative outcomes to the ultrasonic scalpel. The small size and flexibility of this device allows robotic surgeons to employ safe focal energy without sacrificing operative ergonomics	N/A
Robot-assisted laparoscopic myomectomy and adenomyomectomy with a flexible CO_2 laser device	J Robot Surg;7(2):157-62	Barton SE, Gargiulo AR	2013	› Description of the use of robot-assisted laparoscopic myomectomy or focal adenomyomectomy with CO_2 laser in 13 women with symptomatic uterine fibroids and/or adenomyosis › The average operating time was 169 minutes and the average estimated blood loss was 25 ml. No perioperative complications were observed › Preliminary experience with CO_2 laser has comparable operative outcomes to conventional laparoscopy, with safety and minimal lateral thermal spread combined with the enhanced precision which appears ideal for reproductive surgical applications	N/A

Bartholin's Gland

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
Treatment of Bartholin gland cyst with CO_2 laser	Einstein (Sao Paulo), 14(1):25-9	Speck NM, Boechat KP, Santos GM, Ribalta JC	2016	› Describing the results of treatment with CO_2 laser for Bartholin's gland cysts in 31 women in an outpatient clinic › There were no complications. 5 patients (16.1%) had recurrence of the cyst and underwent a second successful session › CO_2 laser surgery was effective to treat Bartholin's gland cysts with minimal or no complications, and can be performed at an outpatient setting	N/A
Feasibility of office CO_2 laser surgery in patients affected by benign pathologies and congenital malformations of female lower genital tract	Eur Rev Med Pharmacol Sci, 19(14):2528-36	Frega A, Verrone A, Schimberni M, Manzara F, Ralli E, Catalano A, Schimberni M, Torcia F, Cozza G, Bianchi P, Marziani R, Lukic A	2015	› Examination of the results of CO_2 laser surgery in patients affected by benign pathologies of the female lower genital tract (Bartholin's gland cyst and others) in 49 women › All procedures had a short operative time, with no complications. Only 1 (2.0%) out of 49 patients required a hemostatic suture for bleeding. Only 6 patients (12.2%) reported pain one day after surgery. Healing was rapid and excellent in all cases, with no wound infection, scarring or stenosis. Preoperative symptoms reduced or disappeared in all cases. No recurrence was observed and no re-intervention was needed › CO_2 laser surgery provides several advantages over traditional surgery, as it reduces patient discomfort, improves short- and long-term outcomes, and optimizes cost-effectiveness	Lumenis laser system

Bartholin's Gland

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
Bartholin's gland cysts: management with carbon-dioxide laser vaporization	Rev Bras Ginecol Obstet, 34(12):550-4	Figueiredo AC, Duarte PE, Gomes TP, Borrego JM, Marques CA	2012	› Evaluation of CO_2 laser vaporization in the treatment of Bartholin's gland cysts in 127 patients › The cure rate after a single laser treatment was 86.6%. There were only 3 cases of minor intraoperative bleeding (2.4%), and 17 recurrences (13.4%) within a mean follow-up of 14.6 months › CO_2 vaporization seems to be a safe and effective procedure for the treatment of Bartholin's gland cysts	N/A
Carbon-dioxide laser vaporization of the Bartholin gland cyst: a retrospective analysis on 200 cases	J Minim Invasive Gynecol, 15(3):327-31	Fambrini M, Penna C, Pieralli A, Fallani MG, Andersson KL, Lozza V, Scarselli G, Marchionni M	2008	› Evaluating the effectiveness of CO_2 laser vaporization as definitive treatment for Bartholin's gland cyst in 200 patients › Median operative time was 17 minutes. 3 cases of intraoperative major bleeding were observed (1.5%). The cure rate was 95.7%. 9 patients had recurrent disease and underwent reintervention with a 100% cure rate › CO_2 laser vaporization of Bartholin's gland cyst represents a safe and effective procedure with complete healing and positive follow-up outcomes	Lumenis laser system

Bartholin's Gland

Title	Publication	Authors	Year	Short summary of study and conclusion	Laser system
CO_2 laser treatment for Bartholin's gland cyst	Int J Gynaecol Obstet, 76(1):79-80	Penna C, Fambrini M, Fallani MG	2002	› Evaluation of CO_2 laser treatment when used for excisional and ablative procedures in the treatment of Bartholin's gland cyst in 111 patients › 1 month after surgery, all patients showed a complete regeneration of the vulvar tissue. Complications were observed in only 5 patients (4.5%). In a 28-months follow-up period, 2 cases of cyst relapses were observed (1.8%) and underwent a second successful CO_2 laser surgery › CO_2 laser was shown to be an effective device for the treatment of Bartholin's gland cyst, with successful therapeutic results. The incidence of intra- and post-operative complications was less frequent than with the classical surgical procedure	Lumenis laser system

Risk information: CO_2 lasers (10.6 µm wavelength) are intended solely for use by trained physicians. Incorrect treatment settings or misuse of the technology can present risk of serious injury to patient and operating personnel. The use of Lumenis CO_2 laser is contraindicated where a clinical procedure is limited by anesthesia requirements, site access, or other general operative considerations. The use of Lumenis CO_2 laser is contraindicated for patients who are not candidates for general surgery, or when local or spinal epidural anesthesia is inappropriate, laparoscopic applications where laparoscopy is contraindicated. Risks may include excessive thermal injury and infection. Read and understand the CO_2 systems and accessories operator manuals for a complete list of intended use, contraindications and risks.

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