BOWA
ACADEMY

GYNAECOLOGY

GYNAECOLOGICAL APPLICATIONS FOR BOWA ELECTROSURGERY SYSTEMS

HYSTEROSCOPY | ADNEXA RESECTIONS | HYSTERECTOMY | ENDOMETRIOSIS | MASTECTOMY | LITERATURE

IMPORTANT INFORMATION

BOWA electronic GmbH has taken the greatest possible care in the drafting of this brochure and in the accuracy of the information contained herein. However, it is not possible to rule out errors completely.

No claims may be lodged against BOWA on the basis of the recommended settings and the data and information presented. If legal liability should result then it will be limited to intentional and gross negligence.

All information on recommended settings, points of application, duration of application and the use of the instruments is based on clinical experience. Some centres and physicians will have a preference for other settings, differing from those recommended here.

The values given herein are guideline values only. They must be verified by the user of the instruments.

Depending on the individual circumstances, it may be necessary to deviate from the information given in this brochure.

Medical technology is advancing continuously through ongoing research and clinical experience. For this reason too, it may be expedient to depart from the settings recommended herein.

To improve comprehension we may refer to one gender or another. Naturally, the information applies equally to both genders.

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1 THE BASIS OF MODERN HIGH-FREQUENCY SURGERY

1.1 | HISTORY OF ELECTROSURGERY [1]

The concept of treating tissue with heat extends back to the era of Egyptian papyri and took the form of ferrum candens ("glowing iron") in the ancient world up to the surgical use of ligatura candens (electrical cutting snare) following the discovery of galvanocautery in the 19th century.

High-frequency surgery (HF surgery) as currently practiced was only developed in the 20th century. Heat is generated in this surgery directly within the tissue itself. This is in contrast to previous techniques in which heat was transferred to the tissue through heated instruments.

The first universal instruments based on tubes were developed around 1955, followed by transistor-based instruments in the 1970s and specifically argon beamers around 1976. Microprocessor-controlled HF surgical instruments have been available since the beginning of the 1990s. These allowed, for the first time, a large number of parameters to be varied so that the current characteristics could be matched to the treatment with precision.

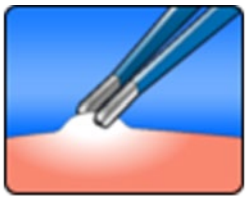
1.2 | THE BASIS OF MODERN HF SURGERY [1]

Depending on its nature, value and frequency, the action of electrical current on tissue may be described as electrolytic (destructive), faradic (stimulating muscles and nerves) or thermal. HF surgery is based on alternating currents with a frequency of at least 200 kHz, with the thermal effect dominating. Its effect is primarily dependent on the time for which the tissue is exposed to the current, the current density and the specific resistance of the tissue, which on the whole falls with increasing water content or increasing blood circulation. In practice, it is also necessary to consider that portion of current which flows past the target tissue and can heat up and damage other regions (such as during irrigation, seen more with monopolar techniques than with bipolar ones).

BOWA ARC 400 HF surgical device

1.3 | ELECTROCOAGULATION [1]

A coagulation effect results if the tissue is heated relatively slowly to a temperature above 60 °C.



Mode icon for moderate coagulation

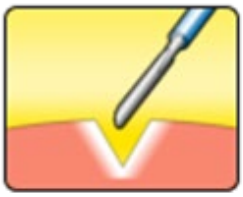
This heating process results in numerous changes to the tissue, including the denaturation of protein, the evaporation of intracellular and extracellular water and the shrinkage of tissue.

Various types of coagulation are possible, depending on the current characteristics and desired outcome, including contact coagulation, forced coagulation, desiccation (coagulation through a needle electrode), spray coagulation (fulguration), argon plasma coagulation (APC), bipolar coagulation and bipolar vessel sealing.

1.4 | ELECTROTOMY [1]

A cutting effect results if tissue is heated very rapidly to a temperature of 90–100 °C. This results in a build-up of steam in the cells which destroys their walls and then acts as an insulator. A voltage then develops between the electrode and the tissue and from a value of approx. 200V there is a renewed sparking with a very high current density at the base points. This

arc will form regardless of the surrounding media (e.g., air or liquid).



Mode icon for standard cutting

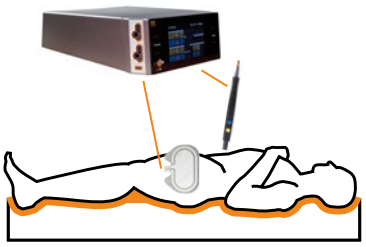
Additional coagulation of the border area of wounds can be achieved through modulation of the current (higher voltage with pauses). The type of cut may be smooth or jagged. The degree of jaggedness can be precisely controlled in 10 different steps and varied to meet requirements with BOWA ARC generators.

Further thermal effects of current that are of subsidiary importance for HF surgery are carbonization (from approx. 200 °C) and vaporization (from a few hundred degrees).

1.5 | MONOPOLAR METHOD [1]

Monopolar HF surgery deploys a closed current circuit in which current flows from the active electrode of the instrument through the patient to a neutral electrode with a large surface area and then back to the generator.

The contact area between the tip of the monopolar instrument and the tissue is small so that the highest current density of the current circuit is seen here, and brings about the desired thermal action.

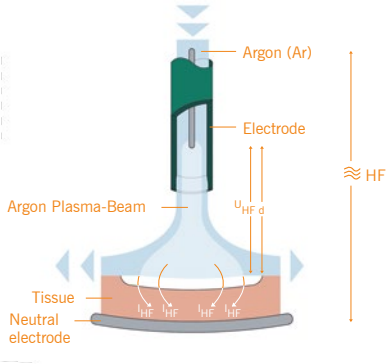


Monopolar principle

Localized heat build-up is reduced to a minimum through the large surface area and the special design of the neutral electrode.

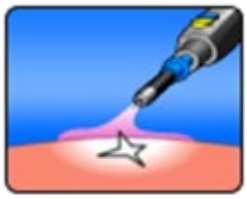
1.6 | ARGON PLASMA COAGULATION (APC) [1]

This is a monopolar non-contact method in which the HF current flows through ionized argon gas into the tissue so that there is no direct contact between the electrode and the tissue and tissue cannot adhere to the electrode.



Principle of APC

Argon is a noble gas that is chemically inert and non-toxic and found naturally in the air. It is introduced through a probe and flows in the ceramic tip past a monopolar HF electrode to which a high voltage is applied. Once the required field strength has been reached it starts to ionize to form plasma, with development of a blue flame – the “argon beam”. The electrically-conducting plasma is focussed automatically on the point with the lowest electrical resistance and at that point coagulates the tissue from a temperature of 50 – 60 °C. The gas prevents oxygen from reaching the tissue and so prevents carbonization. The surgeon has a clear view of the tissue since there is no smoke and there is no adverse effect on wound healing or postoperative bleeding due to carbonization.



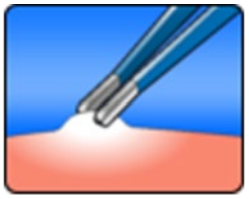
Mode icon for Argon open

These effects enable procedures that have a low complication rate and are safe for effective haemostasis and the devitalisation of tissue anomalies through homogeneous surface coagulation and a limited penetration depth.

1.7 | BIPOLAR METHOD [1]

With bipolar HF surgery two active electrodes are integrated into the instrument and current flow is restricted to the tissue between the two electrodes rather than the entire body of the patient.

No neutral electrode is therefore required.

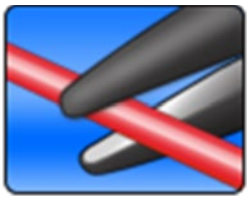


Mode icon for the bipolar method

1.8 | VESSEL SEALING

Conventional electrocoagulation is unsuitable for blood vessels with a diameter above around 2 mm. To be certain of haemostasis and to seal the vessels in the long term it is necessary to use bipolar methods / ligation: The vessel or tissue bundle is gripped using a special instrument and subjected to a constant defined pressure. A number of automatically controlled current cycles are then applied to fuse the vessel walls that lie opposite one another.

In most cases it is not necessary to visualise the vessels individually, a tissue bundle containing vessels can be gripped and fused. The desired effect can be recognized through a translucent white coagulation zone, within which the tissue can be safely separated. In individual cases it may be advisable to seal the vessel in two places at a small distance apart and to make an incision between them. Bipolar sealing is technically possible up to a vessel diameter of approx. 10 mm, and has been clinically validated up to 7 mm.



Mode icon for LIGATION

Since the tip of the instrument will be hot, care must be taken to maintain a safe distance from susceptible tissue and to prevent unwanted coagulation by touching tissue with the instrument or laying it down on tissue.

Various studies have demonstrated that vessels sealed in this manner remain sealed [2-6]. The burst pressure was over 400 mmHg in more than 90 % of cases (up to 900 mmHg), and thus markedly above the blood pressure values encountered in practice (approx. 130 mmHg).

Vessel sealing

Histological studies have shown that shrinkage of the vessel wall and the development of thrombi are involved in haemostasis in conventional coagulation.

In contrast, with sealed vessels there is a denaturation of collagen with fusion of the opposing layers, whilst the internal elastic membrane remains largely intact since its fibres only undergo denaturation above 100 °C.

To the side of the sharply-delineated homogeneous coagulation zone there is a transition zone, generally 1 – 2 mm wide, that exhibits thermal damage, recognizable immunohistochemically of around double the width. This is followed by a sterile resorptive inflammation, in particular in the surrounding connective tissue, without any evidence for even a temporary insufficiency of the sealing.

The advantages of bipolar vessel sealing over other methods such as ligation, sutures and vascular clips include the speed of preparation, the rapid and reliable sealing of vessels, the certainty that no foreign materials will be left in the patient and the lower costs. This results in a shorter surgical time, reduced blood loss and thus less stress for the patient.

BOWA TissueSeal PLUS

The BOWA ligation instruments – NightKNIFE®, TissueSeal® and LIGATOR® – are particularly attractive because they can be re-used and thus reduce operating costs.

These instruments can be used in a range of fields, including surgery, gynaecology and urology, for open and laparoscopic procedures.

1.9 | ELECTROSURGERY – GENERAL CONSIDERATIONS [1]

The user must be familiar with the function and use of the instruments (e. g., instruction according to the MPG, training through the manufacturer).

1.9.1 | SAFETY PRECAUTIONS TO PREVENT COMPLICATIONS [1]

- Checking of insulation
- Use of the lowest possible power setting
- Short and intermittent current flow pattern only
- No activation if current circuit is open
- No activation in the proximity of another HF instrument or if in direct contact with it
- Use of bipolar electrosurgery

1.9.2 | NEUTRAL ELECTRODE [1]

Neutral electrodes are generally disposable accessories in HF surgery for monopolar applications and are used to close the current circuit between the patient and the HF generator on the passive side.

The main risk associated with the incorrect use of a neutral electrode is localised heating of tissue through to skin burns at the contact point and an incorrect functioning of the HF devices and instruments.

Only neutral electrodes that are free of defects and which function correctly are to be used to prevent such unwanted effects. The field in which the neutral electrode is to be used, the patient group (adults or children) and the weight of the patient must all be taken into consideration and any metal jewellery removed in advance.

BOWA EASY Universal neutral electrode

The point at which the neutral electrode contacts the tissue should be chosen so that the current path between the active and neutral electrodes is as short as possible and extends in a longitudinal or diagonal direction to the body since muscles in the direction of the fibrils have a higher conductivity.

Depending on the part of the body undergoing surgery the neutral electrode should be attached to the closest upper arm or thigh, but not closer than 20 cm to the surgical site and at a sufficient distance from ECG electrodes or implants (such as bone pins, bone plates or endoprostheses). If the patient is in a supine position then the neutral electrode must be attached to the upper side of his or her body so that it is not in a region in which fluids collect to prevent their excessive build-up. The electrode should be attached to skin that is clean without too much hair growth and the skin must not be damaged. If it has been cleaned then it should be allowed to dry fully before attachment of the electrode. The electrode must be in full contact with the skin.

The neutral electrode must be fully in contact with the skin since the heat generated is proportional to the surface area of the electrode. The EASY neutral electrode monitoring of BOWA generators stops all monopolar activations if the neutral electrode is in insufficient contact with the skin to ensure maximum patient safety.

Particular care must be taken if patients have pacemakers or intracardial defibrillators. The information provided by the manufacturer of the pacemaker must be followed and if necessary the cardiologist responsible for the patient is to be consulted.

No adverse effects have been reported for the use of monopolar HF surgery in pregnancy. However, for safety reasons it is recommended that bipolar procedures be used.

The packaging of the neutral electrode should only be opened immediately before use. The electrode may be used for up to 7 days after the packaging has been opened, provided that it is stored in a dry place between 0 °C and 40 °C. Each electrode may only be used once and must then be sent for disposal.

1.10 | INTEGRITY OF EQUIPMENT

All instruments, cables and other devices must be inspected before use to make certain that they are undamaged.

All instruments must function smoothly and without friction.

Instruments that do not function correctly, are contaminated or have been used previously must not be used.

If an instrument malfunctions in the course of treatment then the power supply must be interrupted immediately so that there is no unwanted current flow or possible damage to tissue.

Equipment and instruments that have malfunctioned must be repaired by qualified personnel.

If the foot pedal is not being used then it must be kept at a sufficient distance away to prevent its accidental use.

1.11 | NEUROMUSCULAR STIMULATION (NMS)

NMS is a phenomenon seen in electrosurgery, especially in monopolar procedures in which a muscular contraction is triggered through electrical stimulation.

The frequency of NMS can be reduced markedly if the patient is sufficiently relaxed and may be necessary in particular with interventions in parts of the body at particular risk of perforation.

1.12 | CONTACT WITH CONDUCTING OBJECTS

The patient must be sufficiently shielded against contact with conducting objects to prevent unwanted current flow and possible injury.

The patient must therefore lie on a dry surface that is non-conducting.

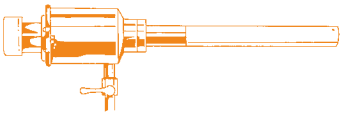
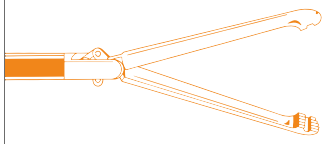
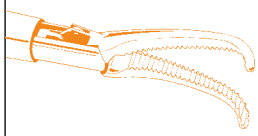
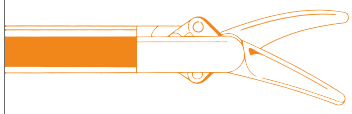
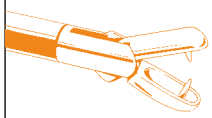
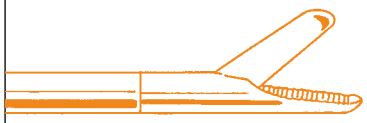
If metal clips are present close to areas in which HF instruments, such as the loop or APC, are being used then they must be kept at a sufficient distance.

2 PRACTICE AND METHODS

There is an increasing trend towards an endoscopic approach for surgical procedures in gynaecology. An open access route remains relevant, however, for certain clinical situations such as ovarian carcinomas. Almost all surgical high-frequency instruments can be used for both open access and endoscopic access. The basics of modern HF surgery and its application to gynaecological conditions frequently encountered are described in this brochure. The most appropriate instruments for the various surgical procedures are also described.

Endoscopy and laparoscopy are now routinely used in clinics. Although risks relating to the technology are rare, as with open surgery there may be perforations, damage to surrounding tissue or bleeding.

The expressions endoscopy and laparoscopy embrace a number of procedures, which are named depending on the operation. For example, gastroscopy means a visual inspection of the interior of the stomach. Pelviscopy is similarly a visual inspection of the pelvic region.

STANDARD INSTRUMENT SETS FOR A PELVISCOPY TRAY[7]	
	VERESS NEEDLE
	TROCARS (11 AND 6 MM)
	ALLIS FORCEPS
	OVERHOLT FORCEPS
	HOOK SCISSORS
	METZENBAUM SCISSORS
	EXCISION FORCEPS
	NEEDLE HOLDER WITH STRAIGHT MOUTH
	SUCTION IRRIGATION TUBE

2.1 | HYSTEROSCOPY

Hysteroscopy is an endoscopic method for the investigation, diagnosis and surgery of the uterine cavity, as well as the cervical canal. The instrument is inserted through the vagina. It may be necessary to dilate the portio and the cervical canal, depending on the diameter of the instrument. A resectoscope may then be used to remove tissue.

High-frequency current is used to stop bleeding and remove tissue. The following are indications for hysteroscopy:

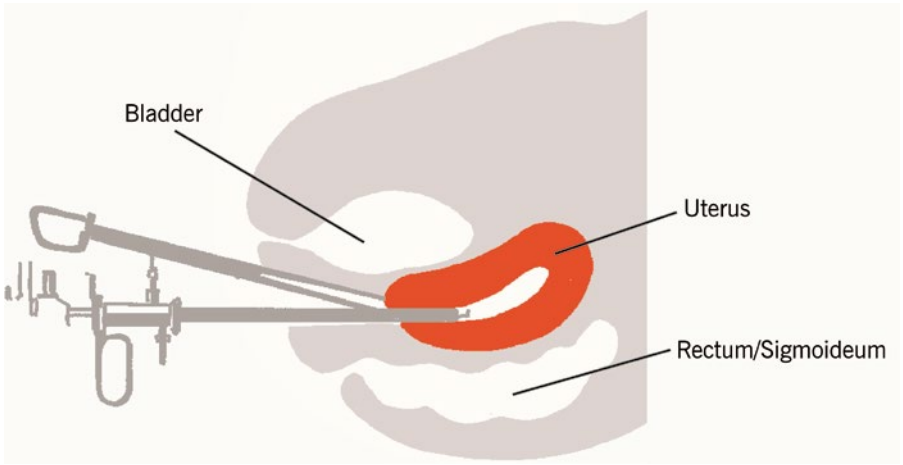
- Disturbances in bleeding
- Ultrasound findings outside of the usual range
- Presence of both benign and malignant tumours in the uterus
- Removal of polyps or myoma nodes which extend into the uterine cavity
- Diagnosis of factors which may lead to infertility, such as the incorrect development or growth of the uterine cavity (e. g., the uterine septum)
- Follow-up after previous interventions involving the uterus
- Location and removal of spirals

A resectoscope may be used for the following procedures within hysteroscopy:

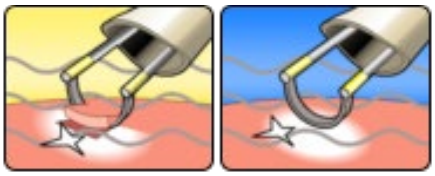
Harnblase = Bladder
Uterus = Uterus
Rectum/Sigmoideum = Rectum/sigmoideum

- Endometrial ablation/resection
- Removal of myomas
- Removal of polyps
- Division of septum
- Removal of growths from the uterine cavity

Although the use of the resectoscope is a reliable and well-established method, there are possible risks and complications, such as perforation, rupture or bleeding. It is necessary to follow the instructions of the manufacturer laid down in the User Manual.



Schematic showing a hysteroscopy



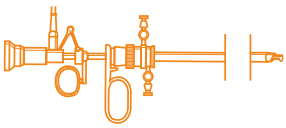
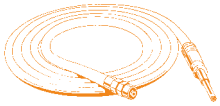
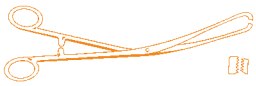
Mode icon for bipolar resection

Monopolar or bipolar electrodes and loops or a rollerball may be used, depending on the requirements.

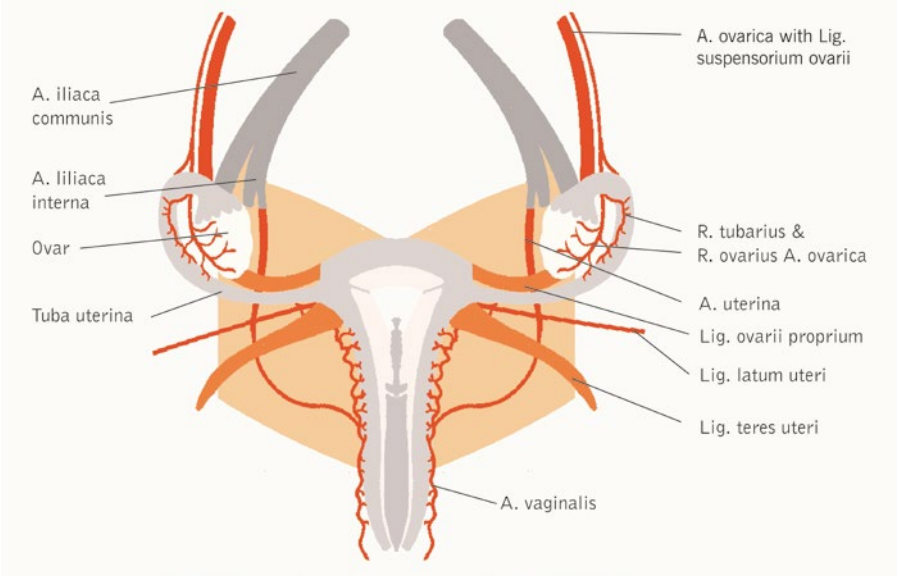
If a monopolar approach is adopted then an irrigation solution that is electrolyte-free will be required. A complication that is rarely seen is hypotonic hyperhydration ("TUR syndrome"). If electrolyte-free irrigation solution enters the blood circulation this can lead to hyponatremia and hypervolaemia.

Possible consequences include disturbances to the circulation with nausea and a confused state. This complication is seldom encountered in centres with sufficient experience. The complication may be circumvented through the use of a bipolar resectoscope(9, 10).

Adhesiolysis can be rapidly and adequately implemented in patients with placenta accreta or placenta percreta through argon plasma coagulation during a hysteroscopy(11 – 13).

RECOMMENDED INSTRUMENTS FOR HYSTEROSCOPY[7]	
	ARC 400 HF GENERATOR
	RESECTOSCOPE (MONOPOLAR OR BIPOLAR)
	FIBRE OPTIC LIGHT GUIDE CABLE
	HOPKINS OPTICS
	SCHROEDER TENACULUM
	HEGAR UTERINE DILATORS
	KRISTELLER VAGINAL SPECULA
	RECAMIER OR SIMS CURETTES
	SIMS UTERINE PROBE

2.2 | ADNEXA RESECTION



Schematic of the uterus

The most common reason for unilateral or bilateral removal of the adnexa (= ovaries and fallopian tubes; adnexectomy, adnectomy, salpingo-oophorectomy) is a suspected malign tumour in this region, extrauterine gravidity or ovarian torsion.

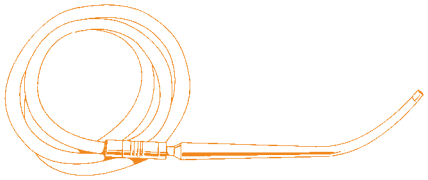
Salpingectomy (without removing the ovaries) is sometimes necessary because of tubar gravidity. A unilateral ovarectomy (oophorectomy) is sometimes required because of cysts or because of ovarian torsion and bilateral ovarectomy to eliminate hormone production, for example in patients with mammary carcinoma.

Laparoscopy may be performed initially in patients with suspected changes to the adnexa for confirmation purposes. If a tumour is suspected then the ovary should be completely removed, either endoscopically or in an open procedure, depending on the circumstances. In patients with a demonstrably malignant tumour open surgery for the relevant tumour stage is required in combination with platinum-containing chemotherapy and will be the decisive factor for the prognosis of the ovarian carcinoma. A decision on lymphonodectomy, bilateral adnectomy, HE, peritoneal resection, omentectomy etc. will depend on the tumour stage and factors such as age, co-morbidity etc.

In cases of demonstrable malignancy and in borderline cases, tissue should be removed for histochemistry during surgery and staging and a lymphadenectomy can be performed. Further procedures should then be discussed with a gynaecological oncologist [14–16].

Electrosurgical procedures may also be used with these interventions. For example, bipolar vessel sealing is of particular value for ligature of the vessel-carrying suspensory ligaments such as the suspensory ligament of the ovary and is also a valuable procedure for omentectomy.

Sensitive tissue must, however, be protected against unwanted heat effects.

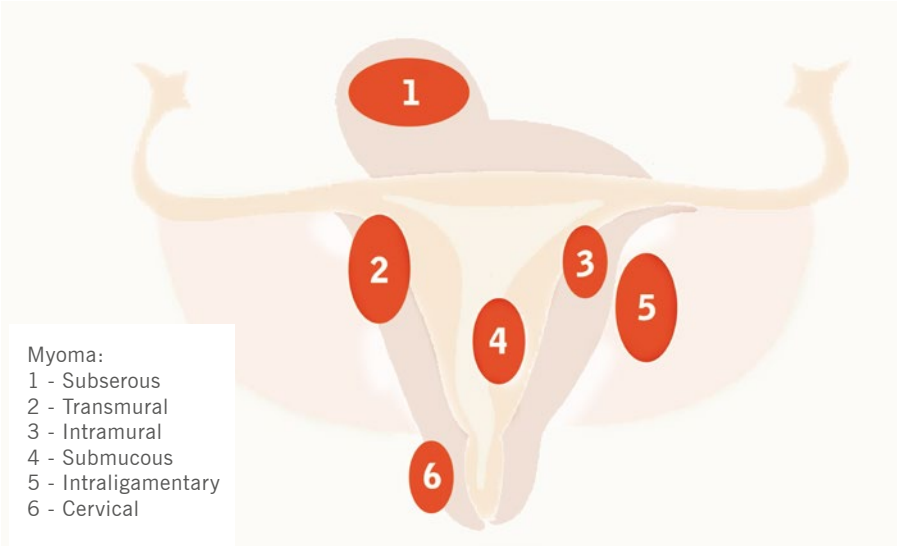
RECOMMENDED INSTRUMENTS FOR LAPAROSCOPIC ADNEXECTOMY (IN ADDITION TO A STANDARD PELVISCOPY TRAY)[7]	
	ARC 400 HF GENERATOR
	ERGOLAP BIPOLAR COAGULATION FORCEPS
	SUCTION TUBE

2.3 | HYSTERECTOMY

It may be necessary to remove the uterus in its entirety or in part for various reasons, for instance in cases of therapy-resistant dysfunctional bleeding disturbances, myoma (uterus myomatosus), endometriosis or tumours [17].

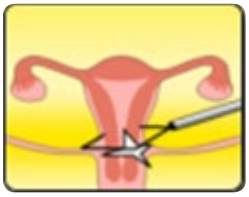
Both abdominal and vaginal access routes may be used for open procedures and endoscopic procedures. The procedure chosen will depend on various factors, such as the primary disease and co-morbidity, as well as the experience of the surgeon. The procedures include abdominal hysterectomy, vaginal hysterectomy, TLH (total laparoscopic hysterectomy), LAVH (laparoscopy-assisted vaginal hysterectomy), LASH (laparoscopy-assisted supracervical hysterectomy) and extended LASH [18].

With the exception of the ligaments that extend in a posterior direction to the rectum and the os sacrum, all of the suspensory ligaments and supplying arteries and veins can be sealed in a bipolar manner in the course of a hysterectomy. Bipolar vessel sealing will lead to a markedly shorter surgery time in abdominal hysterectomy [19].



Localisation of myomas

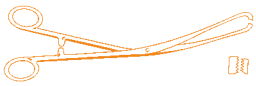
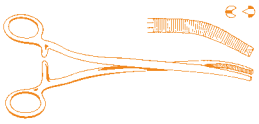
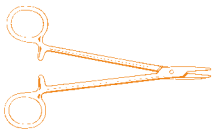
Other electrosurgical procedures can be used, for example, for opening of the abdominal wall and for stopping blood loss. The use of bipolar vessel sealing will markedly reduce the time required for surgery, blood loss and the need for transfusion [20].

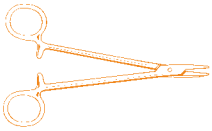


Mode icon MetraLOOP

It is important that there is no thermal damage to the ureters and that overall there is a sufficient safety margin with respect to temperature-sensitive tissue in the region, in particular nerves and the intestines.

In endoscopic hysterectomy procedures a vessel-sealing instrument assists in the ligation of the upper suspensory apparatus with the proper ligament of the ovary and the round ligament. The tubes and the broad ligament of the uterus can also be coagulated and divided. In the LASH procedure loops may lead to removal of the corpus with associated time savings and at the same time increase safety with regard to the risk of injury to the bladder and intestines.

RECOMMENDED INSTRUMENTS FOR LAVH AND VAGINAL HYSTERECTOMY (IN ADDITION TO A STANDARD PELVISCOPY TRAY)[7]	
	ARC 400 HF GENERATOR
	ERGOLAP BIPOLAR COAGULATION FORCEPS
	BOWA TISSUESEAL PLUS
	BOWA BIZZER
	SCHERBACK SPECULA
	DOYEN VAGINAL SPECULA
	WERTHEIM HYSTERECTOMY CLAMPS
	SCHRÖDER TENACULUM FORCEPS
	SIMS SCISSORS
	COOPER SCISSORS
	PÉAN CLAMPS
	MIKULITZ CLAMPS
	HEGAR NEEDLE HOLDER

RECOMMENDED INSTRUMENTS FOR TLH (IN ADDITION TO A STANDARD PELVISCOPY TRAY)[7]	
	ARC 400 HF GENERATOR
	ERGOLAP BIPOLAR COAGULATION FORCEPS
	NIGHTKNIFE VESSEL SEALING INSTRUMENT
	HOHL UTERINE MANIPULATOR
	HEGAR NEEDLE HOLDER

RECOMMENDED INSTRUMENTS FOR LASH (IN ADDITION TO A STANDARD PELVISCOPY TRAY)[7]	
	ARC 400 HF GENERATOR
	METRALOOP LOOP FOR REMOVAL OF THE UTERUS
	ERGOLAP BIPOLAR COAGULATION FORCEPS
	NIGHTKNIFE VESSEL SEALING INSTRUMENT
	ERGO 300 MORCELLATOR
	UTERINE MANIPULATOR

2.4 | ENDOMETRIOSIS

Endometriosis is defined as the presence of endometrium-like cell clusters outside the uterine cavity. It is one of the most common gynaecological diseases during the child-bearing years and is regarded as oestrogen-dependent. The main symptom is a pain in the lower abdomen and infertility is a frequent associated factor. There is an associated morbidity that is noteworthy.

Since the etiology and pathogenesis of endometriosis have not been finally clarified, no causal therapy has been possible to date. Nevertheless, both diagnostic and therapeutic measures have been developed to reduce the symptoms and to reduce morbidity overall.

In pathology/histology terms endometriosis is a benign disease. It can, however, spread to other organs through infiltration and necessitate extensive surgery.

The primary aim of treatment is the laparoscopic removal of clusters in the peritoneum. It is not clear whether the various approaches – coagulation, vaporisation and excision – are of equal value.

The most effective way of treating ovarian endometriosis is its surgical removal. Surgical laparoscopy is the most suitable method [21,22].

Cochrane analysis has shown that the best results in terms of a reduction in pain and recurrence and pregnancy rates are achieved through ovary-retaining removal (extraction) of the cyst body, compared with thermal destruction through high-frequency current, laser vaporisation and argon plasma coagulation.

Mode icon for argon

Treatment of ovarian endometriosis with medicines alone is insufficient and is not recommended. Administration of a GnRH analogue before surgery may lead to a reduction in the size of the endometrium. Resection in sano is the preferred option for symptomatic deep-infiltrating endometriosis. Various approaches are possible, including vaginal resection, laparoscopy, laparoscopy-assisted vaginal approach and laparotomy. If the endometriosis is manifest is other organs, such as the rectosigmoid, bladder and ureter, then pre-surgical planning and advice must be provided to the patient with input from specialists in visceral surgery and urology. If the patient has a desire for children then it will be necessary to retain the uterus and may necessitate that the resection of the endometriosis be incomplete [21].

Within laparoscopy, endometriosis clusters can in most cases be reliably removed through argon-plasma coagulation [23–25].

RECOMMENDED INSTRUMENTS FOR RESECTION OF ENDOMETRIOSIS (IN ADDITION TO A STANDARD PELVISCOPY TRAY)	
	ARC 400 HF GENERATOR
	ARC PLUS ARGON COAGULATION INSTRUMENT
	ARGON HANDLE WITH ELECTRODE
	ERGOLAP BIPOLAR COAGULATION FORCEPS

2.5 | MASTECTOMY

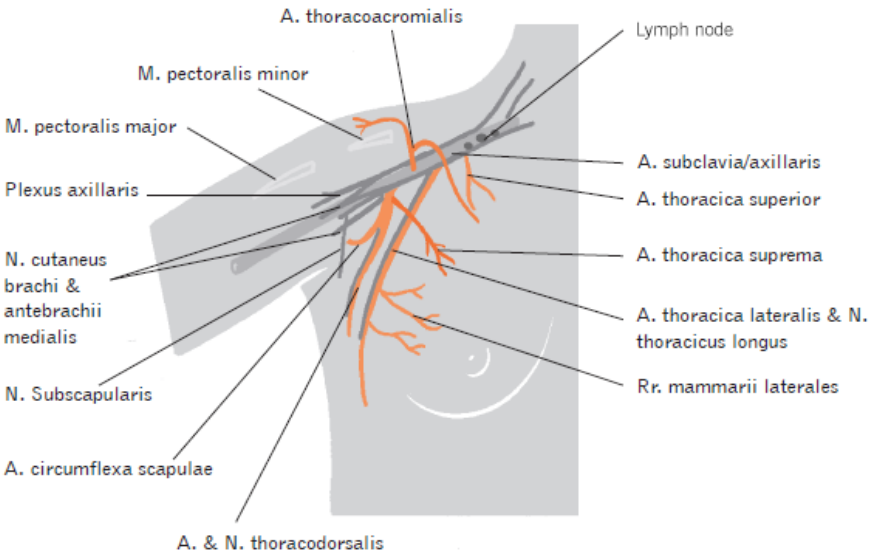
The most common reason for a mastectomy is cancer. The aim of surgery is removal of the primary tumour with a sufficient safety margin and possible lymphonodectomy (sentinel, axillary lymph node dissection). Depending on the diagnosis, some of the breast tissue may be retained (partial resection: segmental or quadrant resection) or a (modified) radical mastectomy is performed, if necessary with inclusion of the axillary lymph nodes, which is also possible in the sentinel approach. It is also possible with a neoadjuvant approach.

Breast-retaining therapy with subsequent radiation therapy of the entire breast is equal to modified radical mastectomy alone in terms of survival.

A modified radical mastectomy should be carried out in the following circumstances:

- Diffuse, extensive calcification of a malignant nature
- Multicentricity
- Incomplete removal of the tumour (including intraductal components), including after repeated resection
- Inflammatory mammary carcinoma (also after successful neoadjuvant therapy)
- Anticipated unsatisfactory outcome in cosmetic terms with breast-retaining therapy
- Contra-indications for subsequent radiation after breast-retaining therapy
- Wishes of the patient after explanation of the risk/benefit [26]

The current S3 Guidelines should be followed where possible since failure to observe them may lead to a significantly poorer outcome [27].



Schematic of the vascular system of the breast

Mode icon for laparoscopy

Electrotomy and electrocoagulation may be used in procedures for the breast and axilla, together with bipolar vessel sealing for ligature of the supplying vessels. Care must be taken not to damage the nerves within the region being operated on (e.g., the long thoracic nerve and branches of the brachial plexus, such as the thoracodorsal nerve) to avoid sensory damage or paralysis.

It is recommended that a smoke-removing system be deployed so that the surgeon has a clear view.

RECOMMENDED INSTRUMENTS FOR MASTECTOMY [28]	
	ARC 400 HF GENERATOR
	SHE SHA SMOKE REMOVAL SYSTEM
	BIZZER BIPOLAR SCISSORS
	PREPARATORY SCISSORS
	SKIN HOOKS
	ROUX HOOKS

2.6 | CERVICAL CONISATION

Cervical conisation is performed if in the course of cancer screening there are cytological findings that give cause for concern (smear test) and if after colposcopy (examination of the vagina and cervix uteri with a microscope at a magnification between x3.5 and x30) and targeted tissue sampling further clarification is required.

Conisation is required in the following cases [7]:

- Necessity for complete histological assessment in cervical intraepithelial neoplasia
- Discrepancy between cytological and colposcopic findings
- Changes in the cervical region that cannot be seen

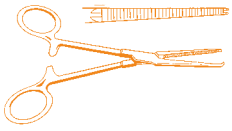
Conisation is a surgical procedure [29] that is normally carried out under complete or partial anaesthesia, with localised anaesthesia in rare cases. In this procedure tissue in the region of the external orifice of the uterus is removed. Conisation can be performed using various surgical techniques (scalpel, laser or electrical loop). The preferred option today is the use of an electrical loop – Large Loop Excision of the Transformation Zone (LLETZ) or Loop Electrical Excision Procedure (LEEP).

BOWA LLETZ electrode

Before the intervention, the bladder of the patient is generally emptied through insertion of a catheter. After disinfection, opening of the vagina and in individual cases local injection of a medicine into the uterus to reduce bleeding, tissue in the region of the external orifice of the uterus is removed in the form of a cone. The depth and width of the cone will depend on the age of the patient and on the pre-operative findings. If the operation is performed with an electrical loop, then in most cases less tissue is removed than with classical knife conisation.

It is recommended that a smoke-removing system be deployed so that the surgeon has a clear view.

Curettage is then carried out in the region of the uterus neck using a curette. At the end of the procedure the resultant wound surface is electrically treated to seal it. In rare cases it may be necessary to insert a tamponade into the vagina to stop blood loss, which can be removed a few hours later.

RECOMMENDED INSTRUMENTS FOR CONISATION [7]	
	ARC 400 HF GENERATOR
	SHE SHA SMOKE REMOVAL SYSTEM
	BALL ELECTRODE
	LEETZ ELECTRODE
	SIMS UTERINE SCISSORS
	METZENBAUM SCISSORS
	COOPER SCISSORS
	PÉAN CLAMPS
	KOCHER CLAMPS

3 FAQ FOR THE USE OF BOWA ARC IN GYNAECOLOGY

How does the EASY system function?

The EASY system is used to monitor split electrodes. It recognises detachments and stops all monopolar activations in the event of a fault, so that the risks of burns at the point of contact of the electrode are reduced to a minimum.

A dynamic reference resistance is set for the use of the neutral electrode. Once the measured resistance at the neutral electrode is 50 % greater than the reference resistance then the EASY system stops monopolar activation, issues an audible signal and displays an error message.

What are the advantages of bipolar resection?

When bipolar methods are used current flow is localised between the two electrodes to the instrument. Tissue is therefore heated up in a localised manner and the risk of damage to deeper-lying structures is reduced. Since no neutral electrode is required there is no danger of tissue being burnt.

Bipolar resection permits the use of NaCl as a conducting irrigation solution and thus lowers the risk of TUR syndrome.

What is TUR syndrome?

If a monopolar procedure is used with non-conducting irrigation solutions and the solution enters the blood circulation during surgery when the veins are opened this may result in an increased volume, a disruption of electrolyte balance and hyponatraemia.

This may affect various parts of the body – the central nervous system (e.g., headaches, cerebral oedema, cramps or coma), the cardiovascular system (disturbed blood pressure, pulmonary oedema, cyanosis) or cause generalized problems (such as stomach pain, hypothermia and blood coagulation disturbances such as disseminated intravascular coagulopathy).

What are the risks associated with bipolar resection?

Irrigation must be continuous and continuous activation must be avoided to avoid injury through heating of the irrigation solution.

If a resectoscope with a conducting external shaft is used then conducting lubricating gels must be used as the urethra could otherwise be damaged.

If bipolar resection is adopted, is it possible for the patient to exhibit jerk reactions?

This reaction is observed less frequently with bipolar resection but it is recommended that anaesthesia be used if the resection is carried out in the proximity of nerves.

What is the purpose of BOWA ARC CONTROL?

This enables the necessary power level to be attained in a fraction of a second for a reproducible tissue effect and with the minimum quantity of energy necessary delivered to the patient.

How is the effect of the bipolar resection set on the instrument?

Three effects are available: Effect 1 for needle/knife electrodes and small loops; Effect 2 for loop electrodes and Effect 3 for vaporisation.

Why is a high initial cutting power necessary?

The high-power initial cutting mode means that the arc is deployed without delay so that cutting is free of friction and smooth. The high power output is only delivered during the initial cutting phase and is reduced within a fraction of a second. This is a feature of the ARC 400 and the ARC 350.

What is the purpose of the BOWA COMFORT cable?

The plug contains an RFID chip, enabling the instrument to be clearly identified. Parameters can be automatically pre-selected with enablement of the power required for the application.

Which resectoscopes can be used?

BOWA offers connecting cables for monopolar and bipolar resectoscopes from Storz, Wolf and Olympus.

Is it possible to use the connecting cables of the resectoscope manufacturers with BOWA generators?

In bipolar resection procedures only BOWA cables are to be connected to BOWA ARC generators as these can satisfy the requirements for high initial start-up power and via the chip can enable maximum power release.

Can BOWA cables be used with instruments from other manufacturers?

The connecting cables have been developed specifically for use with BOWA ARC generators with COMFORT function and are not compatible with instruments from other manufacturers.

Can the BOWA ARC generator be used for other applications?

The BOWA ARC 400 may be used in various disciplines in all electrosurgical applications.

Can accessories from other manufacturers be connected to it?

Standard accessories can be used directly without adapters via the corresponding port configuration.

Can the BOWA ARC 400 also be used to seal vessels?

BOWA offers the ARC 400 for ligation and use with numerous reusable instruments for laparoscopy and open surgery.

How many times can BOWA cables be reused?

BOWA guarantees that its cables with instrument recognition will withstand 100 autoclave cycles.

The uses are stored within the instrument and can be read out. If the cables are used beyond the specified service life then this is the responsibility of the user.

What indicates whether an instrument can be used more than once or only once?

All BOWA instruments intended for one use only bear a single-use symbol.

The User Manual for each instrument must be read carefully before use for the first time.

4 RECOMMENDED PROCEDURES BY DIAGNOSIS

The various uses will typically depend on the diagnosis. The table below shows the uses and corresponding diagnosis. Departures from these may be required depending on the clinical circumstances and the rules of the discipline. The applicable regulations must be observed for each discipline.

APPLICATION (OPS 2014)	DIAGNOSIS (ICD 10-GM)
Hysteroscopy (OPS 1-672)	**As diagnostic** Detection of intrauterine bleeding Elucidation of suspected pathologies Staging of endometrial carcinoma Tracking of endometrial hyperplasia Clarification of unclear cytology findings Search for the reasons for infertility Diagnosis of congenital malformation of the uterus **As therapy** Intrauterine foreign bodies (T19.3) Polyps of the uterine body (N84.0) Myoma of the uterus (D25.-) Endometriosis (N80.0) Intrauterine synechies (N85.6) Congenital malformation of the uterus (Q51.-) Transcervical access to the fallopian tubes
Adnexa resections (OPS 5-651, 5-652)	Follicle cysts of the ovary (N83.0) Ovarian cysts (N83.2) Ovarian torsion (N83.5) Ovarian carcinomas (C56.-) Ectopic pregnancy (O00.1) Oophoritis (N70.-) Unknown neoplasia in the ovaries (D39.1) Benign neoplasia in the ovaries (D27.-)
Hysterectomy (OPS 5-683)	Polyps of the uterine body (N84.-) Benign neoplasia in the uterus (D24.-, D25.-) Malignant neoplasia in the uterus (C54.-) Endometriosis (N80.-) Uterine prolapse (N81.2-4)
Mastectomy (OPS 5-87)	Benign neoplasia in the mammary gland (D24.-) Malignant neoplasia in the mammary gland (C50.-) Hypermastia (N62.-)
Cervical conisation (OPS 5-671)	**As diagnostic** Need for complete histological evaluation in patients with cervical intraepithelial neoplasia Discrepancy between cytology and colposcopy findings Non-visible changes in the cervical region
Plastic reconstruction of the uterine tube (tuboplasty; OPS 5-666)	Infertility of tubar origin (N97.1)

5 RECOMMENDED SETTINGS FOR THE BOWA ARC GENERATORS

The recommended instrument settings are given in the table below for the different procedures. Departures from these may be required depending on the clinical circumstances and the rules of the discipline. The applicable regulations must be observed for each discipline.

PROCEDURE	INDICATION/ PROCEDURE	TECHNIQUE	INSTRUMENT	MODE		SETTING		NOTICES
				ICON	DESIGNATION	EFFECT	POWER	
LAPAROSCOPIC INTERVENTIONS	Hysterectomy (LASH)	Monopolar	LASH-Loop (e.g. MetraLOOP)		MetraLoop	2	-	CAVE: Maintain distance from nearby structures
	Laparoscopy Hysterectomy (e.g. LASH, TLH, LAVH) Adnexresection Endometriosis Tubal ligation Tuboplasty		monopolar lap. Instrument		laparoscopy	3 – 6	70 – 100 W	Always follow the general rules of monopolar techniques
					laparoscopy	-	40 – 90 W	
					forced mixed	2 – 3	40 – 80 W	
					argon open	-	60 – 100 W	
		Bipolar	bipolar lap. instrument		laparoscopy	-	40 – 70 W	
			bipolar lap. scissors		bipolar scissors	-	40 – 80 W	
					bipolar scissors	-	40 – 80 W	
			sealing-/ ligation-instrument		ligation	-	-	Do not grab too much tissue
VAGINAL INTERVENTIONS	Hysteroscopy	Monopolar	monopolar resectoscope		resection	2 – 4	-	Use non-conductive rinsing fluid (e.g. Purisole®)
					resection	-	60 – 90 W	
		Bipolar	bipolar resectoscope		resection	2	-	Use saline solution as rinsing fluid When coagulating keep contact with the tissue
					resection	-	200 – 300 W	
	Conisation Hysterectomy (vag.)	Monopolar	monop. instruments (e.g. LLETZ-electrodes, knife electrodes)		standard	3 – 7	80 – 150 W	Always follow the general rules of monopolar techniques
					forced mixed	2 – 3	40 – 80 W	
					spray	2 – 4	80 – 120 W	
	Hysterectomy (vag.)	Bipolar	bipolar coagulation-instruments (e.g. forceps)		forceps standard	-	30 – 80 W	
					forceps standard AUTOSTART	-	30 – 80 W	
			bipolar scissors		bipolar scissors	-	40 – 80 W	
					bipolar scissors	-	40 – 80 W	
			sealing-/ ligation-instrument		TissueSeal PLUS	-	-	Do not grab too much tissue
OPEN INTERVENTIONS	Mastectomy Hysterectomy Tuboplasty	Monopolar	monop. instruments (e.g. LLETZ-electrodes, knife electrodes)		standard	3 – 7	80 – 150 W	Always follow the general rules of monopolar techniques
					forced mixed	2 – 3	40 – 80 W	
					spray	2 – 4	80 – 120 W	
					SimCoag	2	60 – 120 W	
		Bipolar	bipolar coagulation-instruments (e.g. forceps)		forceps standard	-	30 – 80 W	
					forceps standard AUTOSTART	-	30 – 80 W	
			bipolar scissors		bipolar scissors	-	40 – 80 W	
					bipolar scissors	-	40 – 80 W	
			sealing-/ ligation-instrument		TissueSeal PLUS	-	-	Do not grab too much tissue

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