WATERJET SURGERY

Gentle interventions in surgery and endoscopy

Waterjet surgery with hybrid technology

Waterjet surgery has been successfully used in medicine for many years. Tissue structures are dissected selectively and gently by waterjet. Blood vessels and nerves remain intact up to a certain pressure. Thereafter, vessels may be treated according to with their size. Waterjet elevation can also be used to create fluid cushions in the tissue and to separate anatomical layers from one another.

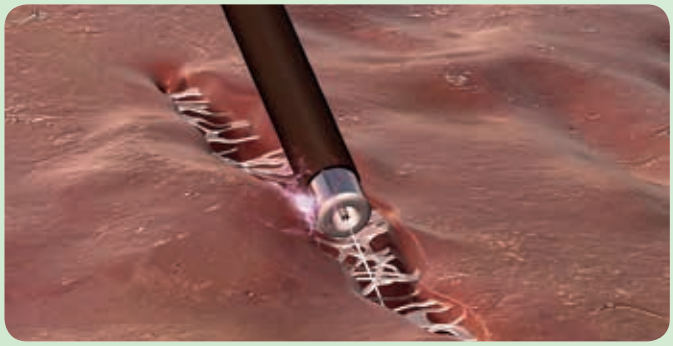


Fig. 1: Selective dissection:
The waterjet function of the applicator with HF function reveals vessels which may be selectively coagulated using the HF function (example: liver surgery).

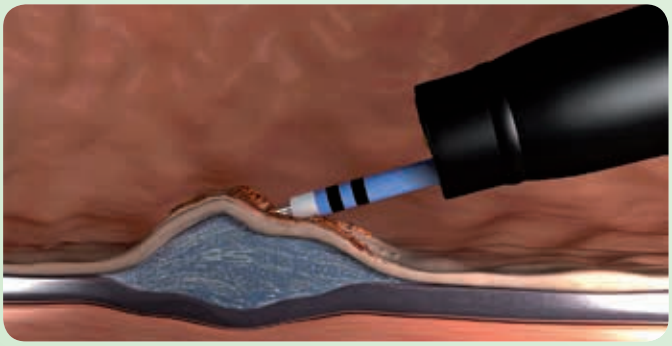


Fig 2: Elevation:
Before endoscopic submucosal dissection (ESD) using the HF function, the mucosa is raised via the waterjet function. The HybridKnife® makes ESD simpler and safer.

ADVANTAGES OF WATERJET SURGERY AT A GLANCE

- ☑ Gentle on blood vessels, nerves and organs (fig. 1)
- ☑ Minimized bleeding, controlled management of bleeding
- ☑ High degree of tissue selectivity during preparation and dissection of tissue layers
- ☑ Needleless high-pressure elevation to create a fluid cushion (fig. 2)
- ☑ Good visibility at the operative site due to integrated irrigation and suction
- ☑ Saves time overall in the OR

Besides surgical procedures on the liver, the technique has become established in further areas of application, especially by virtue of the development of new hybrid instruments. Thus, the waterjet is not only expanding the range of possible interventions, but in combination with high-frequency (HF) functions, is setting new standards worldwide.

ERBEJET® 2

the basic module for hybrid technology in the system

- Time can be saved in the OR, since no change of instrument is necessary
- Both technologies are available at the same time and may be used simultaneously or in alternation
- The devices and instruments are ideally matched to one another

Hybrid technology: A strong partnership – HF combined with a waterjet function

The ERBEJET 2 is compatible with the Erbe Workstation and may be used as a module or as an individual device on a cart and ceiling arm in the OR. The combination of two technologies – HF and waterjet – is unique and offers the following advantages:

01 The **VIO 300 D/VIO 200 D** provides the appropriate cutting and coagulation modes for optimum effect of HF surgery

02 **APC 2** for hemostasis of bleeding tissues and devitalization of pathological tissue

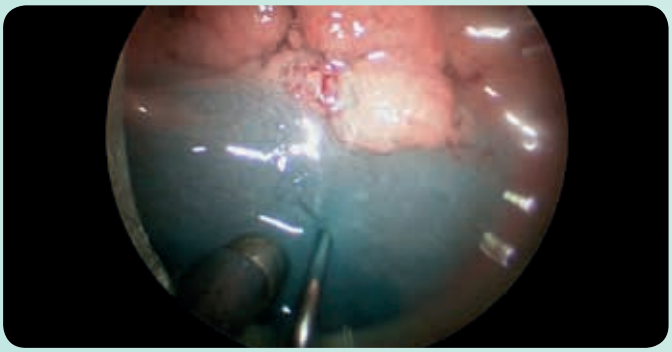
03 **ERBEJET 2** is the basic module for the hybrid technology. The waterjet is used for elevation and separation of tissue layers. Parenchyma can be dissected and vessels and nerves prepared

04 The **ESM 2** suction module permits good visibility of the target site. Suction may be activated individually or automatically, i.e. synchronously with the waterjet.

05 Activation of the waterjet and change of program via **footswitch**

The application spectrum of the ERBEJET® 2

HF and waterjet functions integrated in one instrument (e.g. for liver surgery)



For TEM, the resection plane is raised by submucosal elevation

GENERAL SURGERY/VISCERAL SURGERY
LIVER SURGERY

During **resection of the liver**, the blood vessels and bile ducts are separated selectively from the parenchyma and their size is revealed by the waterjet. By means of the instrument **(applicator, straight, with monopolar HF function)**, small vessels may be coagulated simultaneously with hybrid technology or in alternation with the waterjet function, all without changing instrument. Large vessels are treated separately with ligature or clip.

The duration of the procedure is shorter than that of other surgical techniques. Intraoperative blood loss is reduced, as is the need for blood transfusions. In many cases, there is no need for the Pringle maneuver – occlusion of the blood supply.
That's what well-designed management of bleeding should look like!

Further advantages of the applicator with hybrid function:

- ☑ **Synchronous and well-designed coagulation, as required**
- ☑ **Selectivity protects tissue and adjoining structures**

GENERAL SURGERY/VISCERAL SURGERY
COLORECTAL SURGERY

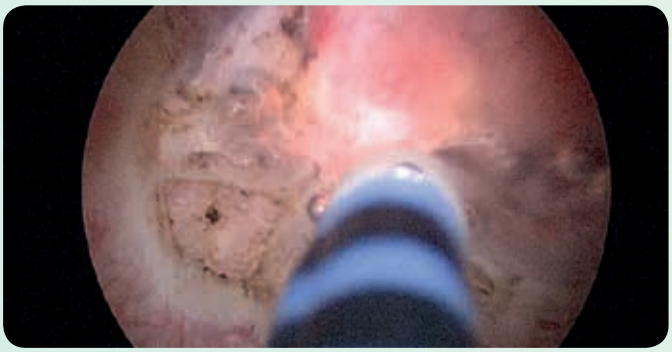
The waterjet is used in **TME (Total Mesorectal Excision)** for preparation and mobilization of the mesorectal layers. By virtue of the selectivity, nerves and vessel structures are treated gently. The risk of post-operative bladder and sexual function disorders is reduced.

For **TEM (Transanal Endoscopic Microsurgery)** in ESD technology, the resection plane is raised beforehand by submucosal elevation using the high-pressure waterjet. As a result, the tissue may be resected more safely with thermally and mechanically protective water cushions.

Applicator, straight
with monopolar HF function
No. 20150-036

Applicator, curved tip
No. 20150-026

Elevation of the mucosa before endoscopic submucosal dissection (ESD)



Elevation before resection of the bladder tumor

GASTROENTEROLOGY

The **HybridKnife®** is a flexible probe with integrated HF and waterjet functions. It is used for **ESD** (Endoscopic Submucosal Dissection) in the gastrointestinal tract. All 4 steps of the procedure – marking of the tumor, elevation of the mucosa, resection and subsequent coagulation – are performed with the multifunctional HybridKnife, without any change of instrument.

The high-pressure waterjet creates a submucosal water cushion that raises the tumorous mucosa. The cushion protects the muscularis from thermal and mechanical injury during the subsequent resection. In this way, the HybridKnife offers maximum safety in ESD.

Further applications in hybrid technology:

- ☑ **Submucosal tunneling and endoscopic resection (STER)**
  for therapy of submucosal benign tumors with HybridKnife T-Type, I-Type
- ☑ **Peroral endoscopic myotomy (POEM)**
  for therapy of achalasia with HybridKnife T-Type, O-Type, I-Type
- ☑ **Endoscopic mucosal resection (EMR)**
  for therapy of early-stage carcinoma in the gastrointestinal tract using the flexible probe
- ☑ Devitalization of **Barrett's esophagus** with HybridAPC, a combination instrument using waterjet and APC technology

HybridKnife O-Type, I-Jet
safe and simple resection after elevation,
e.g. during ESD in the gastrointestinal tract
No. 20150-062

UROLOGY

By applying the waterjet function of the **HybridKnife** in **early-stage bladder carcinoma**, the tumorous mucosal layer is raised selectively. The fluid accumulates in the form of a safety cushion in the submucosa. During the subsequent resection of the tumor by HF surgery, the cushion protects the muscularis from perforation and mechanical injury. In this way, even large tumors that have not invaded the muscularis may be resected en bloc and with tumor-free margin.

A current multi-center study at large urological institutions is investigating possible advantages of the technique. The resected tissues of both technologies will be compared with respect to their pathological assessment, which will influence further therapy.

Further applications of the waterjet technology in urology:

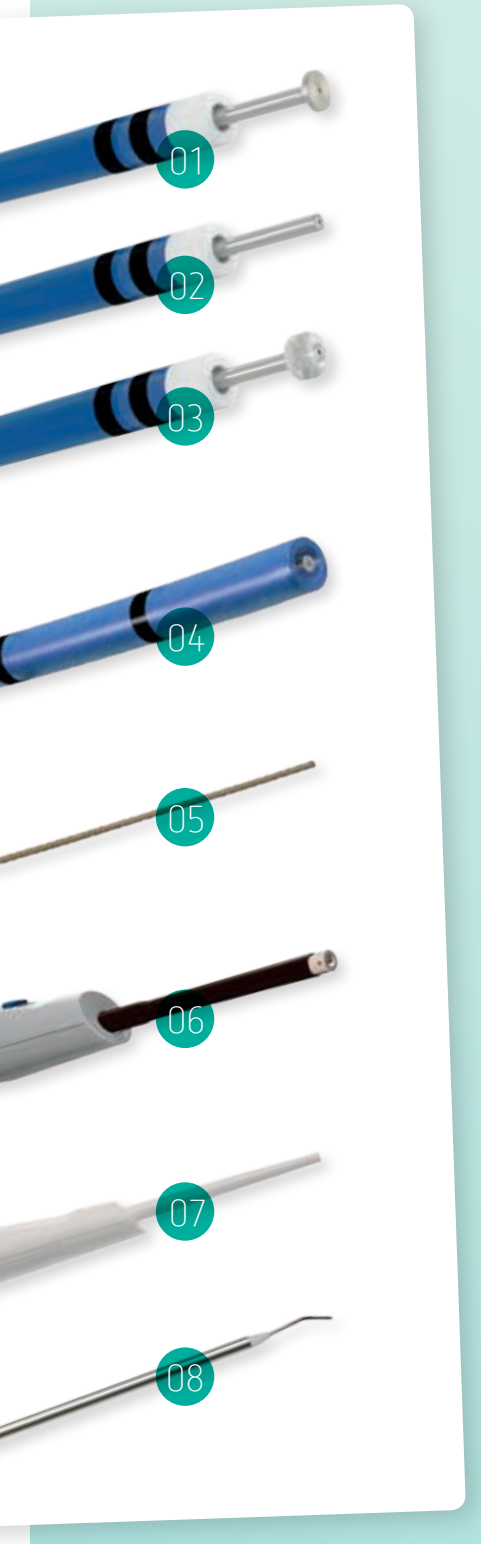
- ☑ **Nerve-preserving prostatectomy**
  (by laparoscopy and open surgery)
- ☑ **Partial kidney resection**

HybridKnife T-Type, I-Jet
1 instrument, 4 functions
No. 20150-060

Instruments

for open surgery, laparoscopy and endoscopy

As sterile disposable products, the applicators and probes of the ERBEJET 2 can be used immediately. They offer consistent quality and safety. With different geometries and lengths, they are ideal for the disciplines listed below. Hybrid instruments offer advantages during application thanks to the double function that is available at any time.



01 **HybridKnife, T-Type, I-Jet**
No. 20150-060

02 **HybridKnife, I-Type, I-Jet**
No. 20150-061

03 **HybridKnife, O-Type, I-Jet**
No. 20150-062

Gastroenterology: ESD in esophagus, stomach, colon POEM for achalasia therapy
STER of submucosal tumors

Urology: en-bloc resection of early-stage bladder carcinomas

04 **HybridAPC**
No. 20150-015

Gastroenterology: for well-designed devitalization (ablation) of Barrett's esophagus;
1 instrument for all esophagus lumens

05 **Flexible probe**
No. 20150-020

Gastroenterology:
for elevation before EMR

06 **Applicator, straight,**
with monopolar HF function
No. 20150-036

General/visceral surgery (by open surgery):
Liver surgery, partial liver resection

Urology: partial nephrectomy

07 **Applicator, straight**
No. 20150-030

General/visceral surgery (by open surgery):
Liver surgery

08 **Applicator, curved tip**
No. 20150-026

Urology: nephrectomy
General/visceral surgery (by laparoscopy):
Liver surgery, TEM

Technical data

ERBEJET 2		
No. 10150-000	Supply voltage	120 – 240 V
	Mains current	0.4 – 1.2 A
	Frequency	50 Hz / 60 Hz
	Mains fuse	2 x T 3.15 A
	Pressure generation	Sterile single-use double piston pump
	Pressure range with 120µm jet nozzle (± 20 %)	1 – 80 bar (100 – 8000 kPa)
	Volume flow (±10 %)	1 – 55 ml / min
	Effect settings	Parameters adjusted according to individual specifications with storage space for 9 program settings
	Activation	Foot switch
	Width x height x depth	410 mm x 130 mm x 370 mm
	Weight	11 kg
	Separation medium	Sterile physiological saline solution
	Jet nozzle diameter of the applicators	120 µm

ESM 2 Suction module		
No. 10340-000	Max. negative pressure (± 50 mbar)	Adjustable from -100 to -800 mbar (sea level)
	Suction capacity (± 10 %)	Depends on the setting of max. negative pressure max. 25 l / min

Classification of ERBEJET 2 and ESM 2	
Protective class acc. to EN 60 601-1	I
Type acc. to EN 60 601-1	CF
Class acc. to the EC-Directive 93 / 42 / EEC	IIb

Instruments and accessories	
HybridKnife T-Type, I-Jet	**No. 20150-060**
HybridKnife I-Type, I-Jet	**No. 20150-061**
HybridKnife O-Type, I-Jet	**No. 20150-062**
HybridAPC	**No. 20150-015**
Flexible probe, length 2.2 m, ø 1.3 mm	**No. 20150-020**
Applicator, straight with monopolar HF function	**No. 20150-036**
Applicator, straight, length 65 mm, ø 6 mm, with suction	**No. 20150-030**
Applicator, curved tip, length 336 mm, ø 5 mm, with suction	**No. 20150-026**
Applicator, bayonet (no fig.), length 90 mm, ø 6 mm, with suction	**No. 20150-041**
ERBEJET 2 ReMode two-pedal footswitch	**No. 20150-100**
ERBEJET 2 ReMode one-pedal footswitch	**No. 20150-101**
Pump unit for disposable use	**No. 20150-300**

See the Accessories Catalog for further instruments and accessories.

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