EXTRAPERITONEAL RETROGRADE LAPAROSCOPIC RADICAL PROSTATECTOMY
The Current State of the Heilbronn Technique
The Concept of Restoring Early Continence

Jens RASSWEILER, Giovannalberto PINI
Ali Serdar GÖZEN, Marcel HRUZA
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3rd Edition

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Extraperitoneal Retrograde Laparoscopic Radical Prostatectomy

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The Concept of Restoring Early Continence, 3rd Edition

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1.0 Introduction

Radical prostatectomy is a major potentially curative procedure for the treatment of organ-confined prostate cancer. Most urologists use the retropubic approach because of familiarity with the surgical anatomy, as well as the nerve-sparing technique first described by Walsh. The goals of radical prostatectomy are cancer control, urinary continence, and, eventually, potency, with low morbidity. In 1999, we developed a different laparoscopic technique similar to the classic anatomic radical prostatectomy. Most importantly, this technique included an ascending part, with early division of the urethra, followed by a descending part, with incision of the bladder neck and dissection of the cranial pedicles, seminal vesicles, and vasa deferentia. Even though our earlier experiences were similar to those made with open radical prostatectomy, there was a continuous process of technical evolution within the first 3 years. However, before the laparoscopic approach can be considered a fully satisfactory alternative to open conventional surgery, it must be shown to provide comparable long-term functional and oncological results, i.e. the risk of cancer recurrence increases significantly with positive surgical margins.

In Germany and Italy, 25% of RP are performed by laparoscopy (LRP). Advantages of this approach include reducing the access trauma, providing less pain, bleeding and transfusion rates$^{1-2}$. Nowadays, in the United States (US), more than 70% of radical prostatectomies (RP) are performed robot-assisted using the Da Vinci™ device. In Europe, there is skepticism about the ongoing spread of robotic systems, based on unfavorable experiences in orthopedics and cost pressure$^3$. Furthermore, all robotic-assisted techniques are based on laparoscopy.

The principle goal of the Heilbronn technique (extraperitoneal retrograde LRP) has been to transfer as much of the technical steps of the well-established and refined classic retropubic radical prostatectomy (RRP) to the laparoscopic armamentarium. Several studies have been published about peri-operative morbidity or the impact of technical modifications on short-term results, however, there are only few reports concerning long-term functional and oncological outcome. This is mainly related to the fact, that only a limited number of centres of expertise (i.e., Bordeaux, Paris-Montsouris, Paris-Creteil, Heilbronn, Berlin, Bruxelles, and Cleveland) are in a position to present such results with an adequate follow-up. With the ongoing evolution in laparoscopic technology and proficiency, laparoscopic radical prostatectomy can now be applied effectively not only in terms of surgical outcome, but also with regard to oncological and functional results. Nowadays, laparoscopy is considered feasible because it has been shown to reduce operative and postoperative morbidity while facilitating the preservation of periprostatic vascular, muscular and neurovascular structures by enhanced visualization and optical magnification.

2.0 Historical Background

In 1992, Schuessler attempted the first LRP$^4$. However, his technique did not provide any advantages over retropubic radical prostatectomy (RRP)$^5$. In 1995, Raboy published a case of extraperitoneal LRP$^6$. Gaston$^7$ started LRP in 1997 followed by Guillonneau, Vallancien and Abbou, who popularized the transabdominal access to seminal vesicles$^8-11$. In 1999, Rassweiler developed a retrograde technique similar to RRP$^{12-13}$. In the following years, several groups retraced the French technique$^{14-16}$. In 2000, Bollens revisited the extraperitoneal approach$^{17}$. In 2002, a survey in Germany and Switzerland revealed that 15% of the departments performed LRP, but only 5% did more than 15 cases per year$^{18}$. In 2004, already 19.2% of German departments offered LRP$^{19}$. In 2005, a multi-center study including 5800 patients treated by 50 surgeons was published$^{20}$. In the US, Gill was one of the few who established a program of laparoscopic pelvic surgery$^{21-22}$. Menon initiated the change when hiring Vallancien and Guillonneau to establish LRP at his institution$^{23}$. Perhaps more importantly, he invested in the Da Vinci™ system and managed to perfect robot-assisted laparoscopic prostatectomy (RALP).
3.0 Indications of Laparoscopic Radical Prostatectomy

Indications include men with localized prostate carcinoma and a life expectancy of more than 10 years. All patients with stage T3 or lower, Gleason score \(< 8\) and PSA level lower than \(10 \text{ ng/ml}\) are candidates for the nerve-sparing technique. Those with suspected extracapsular invasion (T3) or perineural invasion in core biopsies should not undergo nerve-sparing surgery (NS) (Table 1).

4.0 Technical Difficulties and Contraindications

Technical problems can be anticipated in cases of previous transurethral resection of the prostate, abdominal or pelvic surgery, laparoscopic hernia repair, pelvic irradiation, and gross obesity and can add to surgery complexity, and such patients should be approached only after considerable experience.

There is no specific contraindication for laparoscopic surgical approach for localized prostate cancer apart from open surgery. There are four absolute contraindications that do not only apply to LRP, but also to the other laparoscopic surgical approaches: abdominal wall infection, generalized peritonitis, bowel obstruction and an uncorrected coagulopathy (i.e. thrombocyte-aggregation inhibitors).

5.0 Anatomy of the Prostate

*Walsh* described three layers covering the anterolateral surface of the prostate: the prostatic fascia overlying the prostatic capsule and the levator fascia. Both fuse laterally to form the lateral pelvic fascia covered by the endopelvic fascia reflecting off the transversalis fascia. Posteriorly, there are the Denonvilliers’ fascia and the prostatic-capsule (Fig. 1). The neurovascular bundles (NVB) run along the postero-lateral part of the prostate between levator and prostatic fascia and contain branches from the inferior vesical arteries running medially to the cavernosal nerve branches originating from the pelvic plexus. These vessels enter the capsule through the prostatic fascia. The nerves initially form a group, approximately 12 mm in width, and converge at the prostatic level to a width of around 6 mm at 5 and 7 o’clock position lateral to the urethra.

---

**Table 1: Criteria for a neurovascular bundle-sparing approach**

<table>
<thead>
<tr>
<th>Clinical Stage</th>
<th>Role in nerve-sparing (NS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>When PSA is relatively low and the number of positive biopsies or the extent of biopsy involvement is limited.</td>
</tr>
<tr>
<td>T2a</td>
<td>A contra-lateral nerve-sparing procedure can be proposed.</td>
</tr>
<tr>
<td>T2b</td>
<td>A nerve-sparing attempt can result in positive surgical margins and give rise to local failure.</td>
</tr>
</tbody>
</table>

Patient selection criteria for a neurovascular bundle-sparing approach.

---

1. Fascial anatomy of the Prostate according to Walsh.
6.0 Technical Evolution

Four approaches have been described:

a) transperitoneal descending, with initial dissection of the seminal vesicles
b) transperitoneal ascending

c) extraperitoneal descending,
d) extraperitoneal ascending technique.

7.0 Surgical Technique

7.1 Patient Positioning and Placement of Ports

The patient lies in a deflected supine position, both arms parallel to the body with adducted legs (Fig. 2a). The abdomen is shaved from the costal margins to the pubic bone. The abdomen, penis, scrotum, upper thighs and perianal region are prepared with iodine-based disinfectant. A rectal balloon-catheter is inflated with 40–60 cc air (Fig. 3). The operating table is placed in 15–20° Trendelenburg. Prior to port placement, a 16-French Foley catheter is inserted under sterile conditions and blocked with 15 cc saline. Alternatively, a lithotomy position can be used (Fig. 2b). Some authors prefer to use a decline of up to 30°–40°.
The extraperitoneal access involves a periumbilical incision followed by extraperitoneal blunt dissection of the space of Retzius (balloon trocar; Figs. 4a,b).

The other ports are placed after establishing the pneumo-extraperitoneum (max. pressure 12 mmHg). (Figs. 5a, b). We use a W-shaped arrangement of the ports with insertion of the first port (12 mm) through a periumbilical mini-laparotomy (Hasson technique). This port is used for the laparoscope and later for retrieval of the specimen. The other four ports (3 x 11-mm ports and 1 x 6-mm port) are placed under endoscopic control after establishing the pneumoperitoneum (max. pressure 15 mmHg, maximum gas flow 30 ml).

The abdomen is inspected for trocar injury, bleeding and adhesions.

Traversing the light prepubic areolar tissue provides access to the space of Retzius. Both sharp and blunt dissection is used to expose the pubic bone caudally as first landmark and the external iliac vessels laterally. The bladder is freed from its anterior attachments. Subsequently, a sixth port (6 mm) is placed in the right lower abdomen. Pelvic lymphadenectomy may be performed next, depending on PSA level and Gleason score.
7.2 Technical Aspects of Early Continence

Long-term continence data exceed 90% in most laparoscopic and robotic series, however early continence data (i.e., 3 months) are still in the range of 40–50%\(^2\). Several concepts have been proposed:

- preservation / reconstruction of puboprostatic ligaments
- suspension of the dorsal venous complex (DVC)
- dissection of a long urethral stump
- preservation of bladder neck
- preservation and reconstruction of rectourethralis muscle

Recently, Tewari\(^3\) introduced the concept of preservation of the puboprostatic collar. We have added the preservation of the levator fascia to this concept yielding excellent short-term continence results (Fig. 6).

7.3 The Heilbronn Concept for Early Continence and Preservation of the Puboprostatic Collar

An endo-peanut sponge holder is used to mobilize the prostate medially, exposing the endopelvic fascia. The fatty tissue covering the prostate is carefully dissected away to expose the pelvic fascia, puboprostatic ligaments, and superficial branch of the dorsal vein.

Old technique: Following lateral incision of endopelvic fascia, the levator fascia was perforated creating a dissection plane along levator ani muscle (Fig. 7, red arrow). Next, the levator (“periprostatic”) fascia was incised to perform an interfascial nerve-sparing technique.

This approach also involved the division of both puboprostatic ligaments and distal ligation of DVC (Fig. 8).

New technique: Following medial incision of endopelvic fascia below the puboprostatic ligaments, the avascular plane between levator and prostatic fascia is developed (Fig. 7, black arrow). Thus, the intra-pelvic branch of the pudendal nerve remains covered by levator fascia. DVC is sutured over the mid-part of the prostate to preserve the puboprostatic collar.

![The puboprostatic collar.](image-url)
As the major tributaries of the dorsal vein of the penis and Santorini’s plexus travel within the anterior prostatic fascia, so the Santorini plexus (DVC) is adequately controlled by two stitches. The needle is positioned parallel to the curve of the symphysis pubis and should be aligned at an angle of 100° relative to the needle holder (Fig. 9) while it is passed from the right to the left side and encircles the dorsal venous plexus (17 mm Vicryl MH 2/0).
Another stitch is placed proximally at the base of the prostate as a backflow stitch. For division of the DVC, a 120°-endodissector is placed over the prostato-vesical junction (Fig. 10) rotating the prostate towards the urethra, and the anterior striated sphincteric complex is reached. The dorsal venous complex is first coagulated with bipolar forceps, then divided cranial to the two distal stitches (Fig. 11) because due to coagulation-induced shrinkage of the tissue with slight cranial traction on the prostate, the coagulated veins and surrounding fibromuscular fatty tissue are prone to retract on both sides.

The 120°-endodissector is placed over the prostato-vesical junction.

New Technique: The dorsal venous complex is sutured over the mid-part of the prostate to preserve the puboprostatic collar.

7.4 Apical Dissection

The approach to the prostatic apex is determined by the decision-making regarding the use of the nerve-sparing (NS) or non-NS technique. The criteria for a neurovascular bundle-sparing approach are shown in Table 1 (see page 7).

The Non-Nerve-Sparing Technique

After transsection of the dorsal vein complex, the anterior striated sphincteric urethral complex is demonstrated. The fibers of this complex at the apex are horseshoe-shaped and form a tubular, striated sphincter surrounding the membranous urethra. The urethral sphincter is incised using bipolar forceps and endoscissors exposing the smooth muscle of the urethra. Under gentle cranial traction of the prostate, anterior rotation of the prostatic apex occurs, and the prostatourethral junction is demonstrated, allowing the anterior wall of urethra to be incised sharply (no electro-coagulation!). Since the verumontanum is considered to demarcate the distal continence zone, urethral transsection should be performed at or just distal to the veru. Sometimes, the apical prostate overlaps the urethra beyond the verumontanum. With urethral transsection at or beyond the apex, the patient can expect a period of incontinence exceeding the one that could have been achieved if the transsection had been made just distal to the verumontanum. For this reason, dissection of the urethra should be performed as near as possible to the prostatic apex before incision is carried out (Fig. 12). Using a grasper (via the 6th port), the Foley catheter is retracted and pulled inside the abdomen to achieve cranial retraction of the gland. This maneuver is facilitated by using the 120°-endodissector to retract the prostate.

Preservation of the rectourethalis muscle requires that the urethra be transected just distal to the verumontanum and close to the prostatic apex.

The 120°-endodissector is placed over the prostato-vesical junction.
The Nerve-Sparing Technique

The nerves are microscopic in size; their anatomic location can be estimated by using the capsular vessels as a landmark. The neurovascular bundles (NVB) are located in the posterolateral side of the prostate, inside a triangle formed by the lateral pelvic fascia (lateral wall), prostatic fascia (medial wall) and the anterior layer of the Denonvillier's fascia (base). Near the apex, the NVB travel at 5 and 7 o’clock positions. The pelvic fascia is incised prior to the incision of the urethra (Fig. 13).

Displacing the prostate on its side exposes the lateral surface of the prostate. A right-angle clamp is inserted under the lateral pelvic fascia beginning at the bladder neck and extending distally towards the prostatic apex, detaching the area of the NVB from the posterolateral prostatic border to dissect it gently off the apical part of the prostate (Fig. 14).

All of the prostatic branches of the NVB are controlled step-by-step using 5-mm Titanium clips.

We avoid the use of bipolar or monopolar coagulation in the vicinity of the neurovascular bundle. The urethra is incised as in the non-sparing technique, but if the striated sphincter is divided in close proximity to the prostatic apex, there is an inherent risk of damage to the neurovascular bundle. As the neurovascular bundle approaches the prostatic apex, it is often attached medially beneath the striated sphincter by an apical vessel. For this reason, the lateral edges of the sphincter should be divided only down to the lateral edge of the smooth muscle of the urethra and not any further posteriorly (not close to the prostatic apex). The same is accomplished during posterior dissection after incision of the urethra. Following division of the bladder neck (BN), the course of the NVB can be demonstrated clearly to determine the adequate position of the clips applied to control the proximal pedicle (Fig. 15).
7.5 Bladder Neck Incision

Once the prostate has been detached from the rectum, the apex is gently pulled ventrally by applying traction on the intra-abdominal Foley. The balloon catheter helps to identify the vesico-prostatic junction. The anterior wall of the bladder neck is incised using bipolar forceps and endoscissors to expose the balloon. Now, the balloon is deflated and the catheter is used as a loop-shaped retractor in order to elevate the prostate and improve exposure of its connection with the bladder neck.

Once the ureteric orifices have been localized, the wall of the posterior bladder neck is dissected with the right angle dissector and transsected to expose the retrovesical space where both vasa deferentia and seminal vesicles can be identified (Fig. 16).

7.6 Division of Lateral Pedicles and Dissection of Seminal Vesicles

Both lateral pedicles are divided gradually, starting from the superficial portions and then the deeper portions by applying two or three lockable 10-mm Hem-o-lock clips. In case of NS technique, we place the clips avoiding injury to the NVB and the pelvic plexus. Following transsection of both vas deferentia, the seminal vesicles are dissected and divided after clipping the vascular supply with 10-mm metal clips. In the nerve-sparing technique, the small arterial branches that travel to the seminal vesicles are clipped in close proximity to them. The specimen is then entrapped in a self-opening extraction bag.

7.7 Urethrovesical Anastomosis

For the urethrovesical anastomosis, the right medial port and the left lateral port are used to provide an optimal working angle (25–35°) between the instruments (Fig. 17a). The anastomosis can be accomplished by using the interrupted, continuous or single-knot technique.

Posterior Reconstruction

Rocco reported on a significant improvement in the rate of early continence following approximation of the prostate-vesicle muscle to the rectourethralis muscle (Figs. 17b–c). Menon did not find any advantage over using the single-knot technique alone. With our old technique, the Rocco suture did not contribute to an increase in the rate of early continence, however, it could be shown to provide relief of tension on the anastomosis and on the NVB.
Van Velthoven Running Single-Knot Suture

The urethrovesical anastomosis is performed using a double-armed bicolored suture (17 cm PDS 3/0 and Biosyn; RB1-needle) sutured together. We start by placing the sutures at 6 o’clock position on the bladder neck and taking the posterior urethra. Once the posterior part of the anastomosis has been accomplished, the sutures are pulled taut to approximate the bladder neck to the urethra (winch mechanism) (Figs. 18a–c).

A F18-catheter is inserted and the anastomosis completed. In difficult situations, a special Bougie allows insertion of a guide-wire for safe placement of the catheter.

Reconstruction of the Bladder Neck

Reconstruction of the posterior bladder neck is required when the orifices are close (< 5 mm) to the resection line (i.e., in case of large mid-lobe). Anterior reconstruction may become necessary, when bladder neck preservation was not possible or indicated.

Urethrovesical anastomosis. Suturing is performed using the right medial port for the needle driver to establish an appropriate working angle between instruments (a). Urethrovesical anastomosis by application of the Rocco stitch (b).

Reconstruction of the posterior bladder neck is required when the orifices are close (< 5 mm) to the resection line (i.e., in case of large mid-lobe). Anterior reconstruction may become necessary, when bladder neck preservation was not possible or indicated.

Urethrovesical anastomosis (c). Schematic depiction of the posterior reconstruction according to Rocco36 which involves approximation of the vesicoprostatic muscle to the rectourethralis muscle and the posterior urethral plate.

17 Urethrovesical anastomosis. Suturing is performed using the right medial port for the needle driver to establish an appropriate working angle between instruments (a). Urethrovesical anastomosis by application of the Rocco stitch (b).

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Urethrovesical anastomosis. Single-knot technique according to van Velthoven using a double-armed bicolored suture. Urethral stitch (inside-out) (a). Bladder neck stitch (outside-in) at 4 o’clock position (b). Approximation of the posterior part of the anastomosis using the winch principle (c).
7.8 Retrieval of the Specimen

Once the drainage tube has been inserted via the right medial 11-mm port under laparoscopic vision, it is fixed to the skin. Next, the prostate is extracted within the organ bag (KARL STORZ Tuttlingen, Germany) (Fig. 19a) via the periumbilical incision (site of the laparoscope, coupled to the video camera). For this purpose, the rectus fascia is incised longitudinally according to the size of the gland (Figs. 19b,c). The entire specimen then is sent to the pathologist for staging of the disease.
8.0 Systematic Review of Collected Data and Outcomes of Treatment

In our department at Heilbronn, Germany, between March 1999 and October 2010 a total number of 2,200 patients were treated using LRP including 80 procedures that were performed with the Da Vinci™ Surgical System38–40 (Table 2).

The following is a systematic review of the collected data covering the functional and oncological outcomes after prostatectomy.

8.1 Complications

We standardized the reporting of complications in our patient group according to the modified Clavien system41 (Table 3). Rabbani42 presented an excellent study using the modified Clavien system in 3,458 patients treated by RPP and in 1,134 patients treated by LRP, with a median follow-up of 37 months. Unfortunately, the authors summarized grade 1–2 (minor) and grade 3–5 (major) complications reporting 19.9% Clavien 1–2 following RRP compared to 37.3% after LRP. Separately, they listed transfusion rates of 55% after RRP and 4% after LRP. Therefore, many patients receiving transfusions were not classified as Clavien 2. Table 4 summarizes the complication rates found in our cohort and compares them with data from other studies.

<table>
<thead>
<tr>
<th>Table 2: Demographical and Clinical Parameters of the Heilbronn Patient Group (n = 2200)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age, years</strong></td>
</tr>
<tr>
<td><strong>BMI, kg/m² (%)</strong></td>
</tr>
<tr>
<td>&gt; 25 (normal weight)</td>
</tr>
<tr>
<td>26–30 (grade I obesity)</td>
</tr>
<tr>
<td>31–40 (grade II obesity)</td>
</tr>
<tr>
<td>&gt; 40 (grade III obesity)</td>
</tr>
<tr>
<td>Mean value (SD)</td>
</tr>
<tr>
<td><strong>Preoperative PSA Level, ng/ml (%)</strong></td>
</tr>
<tr>
<td>&lt; 4.0</td>
</tr>
<tr>
<td>4.0–9.9</td>
</tr>
<tr>
<td>10.0–19.9</td>
</tr>
<tr>
<td>&gt; 19.9</td>
</tr>
<tr>
<td>Median (IQR)</td>
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<tr>
<td><strong>Operating Room Time, (min.)</strong></td>
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<tr>
<td><strong>Type of Access, (%)</strong></td>
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<tr>
<td>Extraperitoneal</td>
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<td>Transperitoneal</td>
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<tr>
<td><strong>NSS, (%)</strong></td>
</tr>
<tr>
<td>Non-nerve-sparing</td>
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<td>Unilateral nerve-sparing</td>
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<tr>
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<tr>
<td><strong>Weight of Specimen, g (%)</strong></td>
</tr>
<tr>
<td>&lt; 30</td>
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<tr>
<td>31–60</td>
</tr>
<tr>
<td>&gt; 60</td>
</tr>
</tbody>
</table>

Table 2 (continued)

| **Volume of Tumor, cm³ (%)** | Total | 550 (28.6 %) |
| 0.01–1.00 | 1228 (59.3 %) |
| 1.01–5.00 | 221 (10.7 %) |
| > 10.00 | 72 (3.4 %) |
| Median (IQR) | 2.0 (1.0–3.5) |
| **Pathologic T stage (pT stage), no. (%)** | Total | 588 (28.6 %) |
| pT2 | 1261 (57.4 %) |
| pT3a | 676 (31.8 %) |
| pT3b | 1020 (48.1 %) |
| pT4 | 157 (7.3 %) |
| **Gleason Score, (%)** | Total | 157 (7.3 %) |
| 4–5 | 229 (10.8 %) |
| 6 | 676 (31.8 %) |
| 7 | 1020 (48.1 %) |
| 8–10 | 157 (7.3 %) |
| **Surgical Margins, (%)** | Total | 157 (7.3 %) |
| No LND | 1683 (76.6 %) |
| PLND | 513 (23.4 %) |
| **LND, (%)** | Total | 157 (7.3 %) |
| No LND | 1400 (63.7 %) |
| Extended LND | 38 (1.7 %) |
| **Lymph Node Status, (%)** | Total | 157 (7.3 %) |
| Negative lymph nodes / no LND (pN0 / pNx) | 2159 (98.1 %) |
| Positive lymph nodes (pN1) | 41 (1.9 %) |

Key to acronyms: SD = standard deviation; BMI = body mass index; PSA = prostate-specific antigen; IQR = interquartile range; NSS = nephron-sparing surgery; SM = negative surgical margins; NLND = pelvic lymph node dissection; PLND = pelvic lymph node dissection.

Table 3: Overall complication rates in n = 2200 consecutive cases of LRP performed at a single center

<table>
<thead>
<tr>
<th>Reintervention status and Clavien grade</th>
<th>within a period of 6 weeks</th>
<th>within entire follow-up period</th>
</tr>
</thead>
<tbody>
<tr>
<td>No reinterventions required</td>
<td>Grade 1</td>
<td>6.8%</td>
</tr>
<tr>
<td></td>
<td>Grade 2</td>
<td>14.3%</td>
</tr>
<tr>
<td></td>
<td>Grade 3a</td>
<td>3.6%</td>
</tr>
<tr>
<td></td>
<td>Grade 3b</td>
<td>1.5%</td>
</tr>
<tr>
<td></td>
<td>Grade 4a</td>
<td>1.5%</td>
</tr>
<tr>
<td></td>
<td>Grade 4b</td>
<td>0.1%</td>
</tr>
<tr>
<td>Key to the Clavien Classification System:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 1: Any deviation from the normal intra-operative or postoperative course, including the need for pharmacologic treatment other than antiemetics, antipyretics, analgesics, diuretics, electrolytes, or physiotherapy;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 2: Complications demanding only for the use of intravenous medications, total intravenous nutrition, or blood transfusion;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 3a: Complications demanding for surgical, endoscopic or radiologic intervention under local anaesthesia;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 3b: Complications demanding for surgical, endoscopic or radiologic intervention under general anaesthesia;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 4a: Life-threatening complications requiring intensive care unit (ICU) management;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 4b: Life-threatening complications requiring intensive care unit (ICU) management;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 5: Death of the patient.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Novara\textsuperscript{43} observed 19\% Clavien 1–2 (including 5.3\% transfusions) corresponding to our series (21.7\% including 10.4\% transfusions) as well as the meta-analysis of Ficarra\textsuperscript{2}. Clavien 3–5 complications occurred in 6.4\% after RRP, and in 8.9\% after LRP, compared to 11.4\% in our series. Even though retrospective analyses can be helpful in evaluating upcoming techniques (i.e., Laparo-Endoscopic Single-Site Surgery, LESS) and contemporary series (i.e., RRP, LRP and RALP), a longitudinal study provides additional information concerning the institutional and individual learning curves. Our institutional learning curve shows a clear trend towards reduction of complications, however, including ups and downs as observed by Novara\textsuperscript{43}. By comparing our first and last 200 cases, we were able to decrease transfusion rates, incidence of rectal injuries, postoperative revisions, conversion rate, and anastomotic strictures. However, we observed no changes with respect to urinary tract infection, prolonged lymph secretion, and any medical complications. Since surgical expertise remains a key factor, it is of vital importance that a proper training program is established.

### Table 4: The Complication Rates for LRP (in the Heilbronn Patient Group) compared to other series

<table>
<thead>
<tr>
<th>Complications</th>
<th>RASSWEILER\textsuperscript{38} LRP (%)</th>
<th>RASSWEILER\textsuperscript{38} First 200 LRP (%)</th>
<th>RASSWEILER\textsuperscript{38} Last 200 LRP (%)</th>
<th>RABBANI et al.\textsuperscript{42} 2010, RRP (%)</th>
<th>RABBANI et al.\textsuperscript{42} 2010, LRP (%)</th>
<th>Literature\textsuperscript{42} RRP (%)</th>
<th>Literature\textsuperscript{42} LRP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinoma / urinary leak</td>
<td>1.4</td>
<td>0.0</td>
<td>1.0</td>
<td>29</td>
<td>8.7</td>
<td>0.2–6.7</td>
<td>1.0–13.6</td>
</tr>
<tr>
<td>Bladder neck contracture</td>
<td>4.6</td>
<td>6.0</td>
<td>2.0</td>
<td>55</td>
<td>0.7</td>
<td>1.0–17.9</td>
<td>0.2–5.3</td>
</tr>
<tr>
<td>Urinary retention</td>
<td>3.0</td>
<td>1.0</td>
<td>2.0</td>
<td>36</td>
<td>3.0</td>
<td>0.6–2.0</td>
<td>0.8–5.9</td>
</tr>
<tr>
<td>Hydronephrosis</td>
<td>0.8</td>
<td>2.5</td>
<td>0.0</td>
<td>0.9</td>
<td>1.9</td>
<td>0.2–1.0</td>
<td>0.0–0.4</td>
</tr>
<tr>
<td>Ureteral injury</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.5</td>
<td>0.2</td>
<td>0.1–0.8</td>
<td>0.2–0.5</td>
</tr>
<tr>
<td>Bladder calculus / suture / clip</td>
<td>0.15</td>
<td>0.5</td>
<td>0.5</td>
<td>0.6</td>
<td>0.2</td>
<td>n.a.</td>
<td>0.8</td>
</tr>
<tr>
<td>Lymphocele</td>
<td>0.7</td>
<td>0.0</td>
<td>1.5</td>
<td>30</td>
<td>5.4</td>
<td>0.1–6.9</td>
<td>0.0–1.1</td>
</tr>
<tr>
<td>Abscess</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.7</td>
<td>1.7</td>
<td>0.4–1.7</td>
<td>0.0–0.7</td>
</tr>
<tr>
<td>Rectal / bowel injury</td>
<td>2.1*</td>
<td>3.0</td>
<td>1.0</td>
<td>0.7</td>
<td>0.4</td>
<td>0.4–4.9</td>
<td>0.0–1.4</td>
</tr>
<tr>
<td>Wound infection</td>
<td>0.5</td>
<td>0.0</td>
<td>0.0</td>
<td>2.3</td>
<td>3.8</td>
<td>0.6–13.8</td>
<td>0.0–1.0</td>
</tr>
<tr>
<td>Cardiac ischemia</td>
<td>0.15</td>
<td>0.0</td>
<td>0.0</td>
<td>0.2</td>
<td>0.4</td>
<td>0.0–1.0</td>
<td>0.0–0.7</td>
</tr>
<tr>
<td>Cardiac arrhythmia</td>
<td>0.2</td>
<td>0.0</td>
<td>0.5</td>
<td>0.9</td>
<td>0.7</td>
<td>0.2–4.8</td>
<td>n.a.</td>
</tr>
<tr>
<td>Respiratory distress</td>
<td>0.3</td>
<td>0.5</td>
<td>0.0</td>
<td>0.6</td>
<td>0.6</td>
<td>0.5–1.2</td>
<td>0.2–0.7</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.3</td>
<td>0.4</td>
<td>0.2–1.4</td>
<td>0.0–0.3</td>
</tr>
<tr>
<td>Ileus</td>
<td>0.3</td>
<td>1.0</td>
<td>0.0</td>
<td>0.3</td>
<td>2.1</td>
<td>0.3–3.0</td>
<td>0.3–5.3</td>
</tr>
<tr>
<td>Acute renal insufficiency</td>
<td>0.05</td>
<td>0.0</td>
<td>0.0</td>
<td>0.7</td>
<td>1.0</td>
<td>0.2–0.4</td>
<td>0.0–0.3</td>
</tr>
<tr>
<td>Venous thromboembolism</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>1.9</td>
<td>2.0</td>
<td>0.4–1.3</td>
<td>0.0–2.4</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>2.1</td>
<td>0.5</td>
<td>0.5</td>
<td>2.8</td>
<td>7.8</td>
<td>0.1–3.0</td>
<td>1.0–2.4</td>
</tr>
<tr>
<td>Anemia needing blood transfusions</td>
<td>14.8</td>
<td>19.5</td>
<td>7.0</td>
<td>55.0</td>
<td>4.0</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Total rate of complications</td>
<td>33.1*</td>
<td>40.0*</td>
<td>24.0*</td>
<td>27.5**</td>
<td>39.0**</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

\* 1.4\% of the cases were managed conservatively (intraoperative suture of superficial bowel/rectal injury followed by parental nutrition for several days and prolonged catheterization time.\ protect="1\%"><\protect="1\%> 1.4\% of the cases were managed conservatively (intraoperative suture of superficial bowel/rectal injury followed by parental nutrition for several days and prolonged catheterization time.\protect="1\%"><\protect="1\%> Including blood transfusions, excluding patients with anemia as only complication; total complication rate amounts to 22.7\%.\protect="1\%"><\protect="1\%> Including blood transfusions, excluding patients with anemia as only complication; total complication rate amounts to 22.7\%.\protect="1\%"><\protect="1\%> Excluding blood transfusions.
Based on our experiences with the Heilbronn Laparoscopic Training Program, the individual learning curve of the third-generation surgeons could be considerably reduced. This also applies to fellows transferring the technique to other departments. A detailed analysis of technical modifications that have been shown to reduce complications can be useful for other surgeons. The rate of rectal lesions could be reduced by introduction of a rectal balloon. Rectal fistulas were eliminated by reducing the power of bipolar coagulation (maximum 50 W) and avoiding Hem-o-lock clips close to the rectum, respectively urethra, which has also proven to reduce the rate of bladder neck strictures due to clip migration. Extravasation requiring retrograde stenting or percutaneous nephrostomy could be minimized by posterior bladder neck reconstruction if the ureteral orifices are close to the line of resection. Based on the low rate of urinary tract infection at our department, we recommend the use of antibiotic prophylaxis.

### 8.2 Functional Results

#### Continence

In order to assess early continence, we introduced a specific parameter, the urine loss ratio (ULR), which is based on a standardized micturition protocol designed to quantify urine loss after catheter removal. If the fist-day ULR is below 0.05, the patient’s probability to become continent within three weeks after surgery is 89%. Taking the ULR as standard of reference, we compared the outcome of our previous technique with / without posterior reconstruction, and found no impact on the ULR (52 vs 54%). When implementing the Heilbronn treatment protocol, the rate of minimal urine loss was found to increase to 92% (Table 5).

<table>
<thead>
<tr>
<th>Urine Loss Ratio (ULR)</th>
<th>Without posterior reconstruction and without preservation of puboprostatic collar</th>
<th>With posterior reconstruction and without preservation of puboprostatic collar</th>
<th>With posterior reconstruction and with preservation of puboprostatic collar</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.02</td>
<td>55.2%</td>
<td>52.3%</td>
<td>52.3%</td>
</tr>
<tr>
<td>&lt; 0.05</td>
<td>22.7%</td>
<td>18.2%</td>
<td>7.7%</td>
</tr>
<tr>
<td>&lt; 0.11</td>
<td>9.4%</td>
<td>18.2%</td>
<td>–</td>
</tr>
<tr>
<td>&lt; 0.16</td>
<td>6.4%</td>
<td>9.1%</td>
<td>–</td>
</tr>
<tr>
<td>Total</td>
<td>92.7%</td>
<td>97.8%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Urine loss ratio (ULR) defined as the weight of urine loss (UL) in the pad divided by the daily micturition volume (MV).
### 8.3 Oncological Results

#### Positive Surgical Margins

Comparative and cumulative studies provided only data on the rates of positive surgical margins (PSM) ranging from 11–37% after RRP, 11–30% after LRP, and 9.6–26% after RALP (Table 5). Accordingly, Guazzoni demonstrated overlapping PSM rates with a level of evidence (IE) IB47. No differences were found between LRP and RALP, considering early (IIB)48 and more advanced phases (IIIB)49 of the RALP learning curves. Table 610, 38, 48–73 gives a global comparative survey on the rate of positive margins (stratified by pathologic stage) in series of LRP and RRP by comparing our latest results with those of other groups.

### Table 6: Comparative Survey on the Rate of Positive Surgical Margins in Series of LRP and RRP

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Rate of positive margins (%) stratified by pathologic stage</th>
<th>Authors (year)</th>
<th>PSA recurrence-free survival</th>
<th>Clinical progression-free survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n°Pz</td>
<td>pT2 (%)</td>
<td>pT3 (%)</td>
<td>pT2 (%)</td>
</tr>
<tr>
<td>---------------</td>
<td>------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>LAPAROSCOPIC RADICAL PROSTATECTOMY (LRP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GUILLONNEAU et al., 200010</td>
<td>350</td>
<td>11.1</td>
<td>37.3</td>
<td>90.4</td>
</tr>
<tr>
<td>STOLZENBURG et al., 200010</td>
<td>300</td>
<td>9.2</td>
<td>30.3</td>
<td>90.4</td>
</tr>
<tr>
<td>ROZET et al., 200554</td>
<td>599</td>
<td>14.6</td>
<td>25.6</td>
<td>SECN et al., 200654</td>
</tr>
<tr>
<td>MARTINEZ-PINERO et al., 200662</td>
<td>604</td>
<td>19.2</td>
<td>53.2</td>
<td>GOEMANN et al., 200657</td>
</tr>
<tr>
<td>LEIN et al., 200655</td>
<td>1000</td>
<td>14.9</td>
<td>54.4</td>
<td>—</td>
</tr>
<tr>
<td>TOUGER et al., 200756</td>
<td>485</td>
<td>8.2</td>
<td>17.2</td>
<td>—</td>
</tr>
<tr>
<td>HRUZA et al., 2010 (RRP)48</td>
<td>2200</td>
<td>6.7</td>
<td>41.3</td>
<td>ERDOGRU et al., 201049</td>
</tr>
</tbody>
</table>

RETROUBIC RADICAL PROSTATECTOMY (RRP)

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Rate of positive margins (%) stratified by pathologic stage</th>
<th>Authors (year)</th>
<th>PSA recurrence-free survival</th>
<th>Clinical progression-free survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n°Pz</td>
<td>pT2 (%)</td>
<td>pT3 (%)</td>
<td>pT2 (%)</td>
</tr>
<tr>
<td>---------------</td>
<td>------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>HULAND et al., 200110</td>
<td>789</td>
<td>14.9</td>
<td>36.5</td>
<td>CATALONA et al., 1998 (RRP)54</td>
</tr>
<tr>
<td>ARTIBANI et al., 200351</td>
<td>50</td>
<td>14.0</td>
<td>43.6</td>
<td>WARD et al., 200452</td>
</tr>
<tr>
<td>SWINDE et al., 200556</td>
<td>1389</td>
<td>7.0</td>
<td>23.0</td>
<td>HAUKAS et al., 200557</td>
</tr>
<tr>
<td>GUAZZONI et al., 200660</td>
<td>60</td>
<td>18.3</td>
<td>31.2</td>
<td>CHUN et al., 200661</td>
</tr>
<tr>
<td>EASTHAM et al., 200764</td>
<td>2242</td>
<td>7.0</td>
<td>22.0</td>
<td>CARANI et al., 200865</td>
</tr>
</tbody>
</table>

Key to Table 6: (a) = only pT3a; (b) = pT3a + pT3b + pT4; (c) = pT3a + pT3b
PSA Recurrence-free Survival

Regarding this point, there is only few long-term data available. Guillonneau reported an overall actuarial biochemical progression-free survival rate of 90.5% at 3 years. The rates were 92% for pT2a, 88% for pT2b, 77% for pT3a, and 44% for pT3b. Based on our data, the overall 10-year PSA recurrence-free survival was 65%, including 80% for pT2 and 51% for pT3-4 (Fig. 20a). Compared to RRP, the oncological outcome was similar. In a multicentric study published by Vickers et al., the authors analyzed the learning curve of LRP based on the PSA recurrence-free status. In a former RRP study, 250 cases performed by one surgeon were identified as necessary to achieve a plateau. In the LRP series including more than 5,000 patients, the same plateau was reached after 750 patients. However, there was an ongoing improvement indicating some advantages attributed to video-endoscopic surgery.

Survival Data

The clinical progression-free 10-year survival was 97% for pT2 and 81% for pT3 (Fig. 20b). We observed a local recurrence in 3% of pT2- and 13% of pT3/4-cases managed mostly by early adjuvant irradiation. Overall 10-year survival was 96.8% for pT2 and 92.2% for pT3 (Fig. 20c).

9.0 Perspectives of LRP

9.1 Ergonomic Deficiencies of LRP

During LRP, surgeons suffer from high levels of mental and physical stress. At the latest after 4–5 hours, the development of fatigue reaches a level which is characterized by mental exhaustion, reduced dexterity, and a reduced capacity for good judgement. Back pain is common. The force to control laparoscopic instruments can be six times higher, and the problem is magnified further by the non-ergonomic design of handles. Likewise, the assistant is usually faced with a high-risk ergonomic situation created by the left leg bearing 70–80% of body weight over time. Even, if the Da Vinci™ system has optimized the ergonomics of laparoscopic surgery, it also has inherent limitations and is not cost-effective. Therefore, a significant effort should be invested to improve the ergonomics of laparoscopy.

9.2 Technological Advances of LRP

The recent introduction of HD video technology has significantly improved depth perception. In 1999, a special chair with pedal switches was proposed to improve ergonomics. Since 2005, we use a surgical support during LRP to reduce the stress exerted on the knee joints, however surgeons still cannot avoid performing an anastomosis in the standing posture. Recently, a specially designed ergonomic body support consisting of a platform with foot pedal, a semi-standing support, a remote control, and a chest support was presented. Electromiography results showed an average reduction of 44% of the erector spinae, 20% for the semitendinosus and 74% for the gastrocnemious muscle, when using the chest support. The average muscle reduction using the semi-standing support was 5%, 12%, and 50% respectively. In 2010, initial experiences have been published using a platform, that allows the surgeon to assume a sitting position above the patient’s head (ETHOS Ergonomic Surgical Platform™). This device seems to have the potential to help overcome all physical stress problems concerning rotation, unstable standing and weight-balance in the future.
10.0 Conclusions

Laparoscopic radical prostatectomy is an original approach designed to achieve the same oncological results as the conventional radical prostatectomy while decreasing morbidity. In contrast to other laparoscopic techniques, the Heilbronn technique provides an excellent basis for the transfer of all technical modifications of open anatomical radical prostatectomy. By comparing the results of laparoscopic versus open radical prostatectomy, considerable differences in the rates of early and late complications and associated morbidity become clearly noticeable, which, in view of similar functional and oncological outcomes, are conclusive arguments in favour of the laparoscopic approach. Based on our own experience with more than 2,500 radical prostatectomies, including all types of modifications (i.e. laparoscopic, retropubic, perineal), it is not surprising that laparoscopy has not yet proven to be superior. In the ‘ideal’ case (i.e., non-obese, less than 60 years, low-volume tumor, low PSA level, no periprostatic adhesions, small gland) the anatomy can be easily demonstrated, independently of the surgical approach, and the procedure can be carried out according the respective technique. Difficult cases (e.g., obese, over 65 years of age, high-volume apical tumor, periprostatic adhesions, large prostate), however, may not always allow the complete transfer of the operative principles of dissection. Again, this is true for all types of surgery. Like its open counterpart, laparoscopic radical prostatectomy has undergone continuing evolution in terms of technique, which is reflected in significant improvements in clinical and operative data. Besides, as mentioned before, functional results considerably depend on factors not related to surgery (i.e. age, concomitant disease). Since the learning curve of laparoscopic surgery has levelled off at the centers of expertise, further studies may now focus on technological advancements in the field of video-endoscopy. In the future, digital recording and playback of procedures (e.g., AIDA system, KARL STORZ Tuttlingen, Germany) is supposed to have a major impact on assessment of individual performance and outcome of laparoscopic surgery. At the authors’ department, a gradual approach is used to make the trainee increasingly familiar with the various stages of a procedure to be learned, allowing a specific operation to be introduced safely to surgeons-in-training. In this way, the Heilbronn technique has been conveyed to interested colleagues from all over the world. Apart from standardization of the technique, continuing training, and enhancement of instrumentation, it is mandatory for achieving best practice performance, that improvements be made in the ergonomics of laparoscopic surgery including working angles and distances between the operating ports, camera port and needle position. There is no doubt, that LRP has lost the race against RALP in the US. Nevertheless, LRP has proven to be safe providing at least similar functional and oncological outcomes as compared to RRP. The future will tell, how much improvements, particularly in the field of ergonomics, will impact the role of LRP worldwide.
References


7. GASTON R. Personal Communication.


Extraperitoneal Retrograde Laparoscopic Radical Prostatectomy


72. WARD JF, SLEZAK JM, BLUTE ML, BERGSTRAHLH EJ, ZINCKE H. Radical prostatectomy for clinically advanced (cT3) prostate cancer since the advent of prostate-specific antigen testing: 15-year outcome. BJU Int. 2005 Apr;95(6):751–6.


Instrument Set for Transperitoneal Laparoscopic Radical Prostatectomy

as recommended by Prof. J. RASSWEILER, M.D.

26003 BA 1 HOPKINS® Forward-Oblique Telescope 30°,
enlarged view, diameter 10 mm, length 31 cm, autoclavable,
fiber optic light transmission incorporated, color code: red

26003 AE ENDOCAMELEON® HOPKINS® Telescope,
diameter 10 mm, length 32 cm, variable direction of view from 0° – 120°,
twisting controller to select the desired view of direction, fiber optic light transmission incorporated, color code: gold

30160 MP 3 Trocar, with pyramidal tip, insufflation stopcock, multifunctional valve, size 6 mm, working length 10.5 cm, color code: black,
including:
Trocar only, with pyramidal tip
Cannula, without valve, with insufflation stopcock
Multifunctional Valve, size 6 mm

30103 MP 2 Trocar, with pyramidal tip, insufflation stopcock, multifunctional valve, size 11 cm, working length 10.5 cm, color code: green,
including:
Trocar only, with pyramidal tip
Cannula, without valve, with insufflation stopcock
Multifunctional Valve, size 11 mm

30107 MP 2 Trocar, with pyramidal tip, insufflation stopcock, multifunctional valve, size 13 mm, working length 11.5 cm, color code: black,
including:
Trocar only, with pyramidal tip
Cannula, without valve, with insufflation stopcock
Multifunctional Valve, size 13 mm

30142 HB 1 Double Reducer,
13/10 mm, 13.5/10 mm, 13/5 mm and 13.5/5 mm

30141 DB 2 Reducer, 11/5 mm

33322 MG 2 CLICKLINE MANHES Grasping Forceps, “tiger-jaws”, 2x 4 teeth, for grasping and removal of solid organs, in particular during adhesiolyses, size 5 mm, length 36 cm

33321 MD CLICKLINE Rotational KELLY Dissecting and Grasping Forceps, without ratchet, insulated, with connector pin for unipolar coagulation, size 5 mm, length 36 cm

33321 R 2 CLICKLINE Rotational Dissecting Forceps, right angled, without ratchet, insulated, with connector pin for unipolar coagulation, size 5 mm, length 36 cm

33533 RG 1 CLICKLINE Rotational Dissecting Forceps, right angled, with hemostat style ratchet, size 10 mm, length 36 cm

33531 MLL 1 CLICKLINE Rotational KELLY Grasping Forceps, without ratchet, size 10 mm, length 36 cm

33531 PR 1 CLICKLINE Rotational RASSWEILER Grasping Forceps, without ratchet, size 10 mm, length 36 cm

34321 MS 2 CLICKLINE Rotational METZENBAUM Scissors, curved jaws, without ratchet, insulated with connector pin for unipolar coagulation, size 5 mm, length 36 cm

34310 MS 1 CLICKLINE METZENBAUM Scissors Insert

38321 MD 1 RoBi® KELLY Rotational Grasping Forceps, CLERMONT-FERRAND Model, double action jaws, especially suitable for dissection, with RoBi® ring handle, with connector pin for bipolar coagulation, size 5 mm, length 36 cm

38321 MS 1 RoBi® METZENBAUM Rotational Scissors, CLERMONT-FERRAND Model, double action jaws, curved, for cutting and bipolar coagulation, with RoBi® ring handle, with connector pin for bipolar coagulation, size 5 mm, length 36 cm

32340 PT 1 Surgical Sponge Holder, foratraumatic dissection of tissue layers, size 5 mm, length 36 cm

26173 BN 1 Suction and Irrigation Tube, anti-reflex surface, with two-way stopcock, for single hand control, size 5 mm, length 36 cm

27566 BL 1 RASSWEILER Transurethral Bougie, 18 Fr., with working channel 9 Fr., for anastomosis during laparoscopic prostatectomy

26173 SKG 1 RASSWEILER Needle Holder, straight jaws, axial ring handle with ratchet, size 5 mm, length 33 cm, for use with suture material 2/0 – 4/0, needle size RB (Ethicon)

26173 SKL 1 RASSWEILER Needle Holder, convex/concave, slim jaws, curved left, axial ring handle with ratchet, size 5 mm, length 33 cm, for use with suture material 3/0, needle size RB-1 (Ethicon)

It is recommended to check the suitability of the product for the intended procedure prior to use.
HOPKINS® Forward-Oblique Telescope 30°
diameter 10 mm, length 31 cm
diameter 5 mm, length 29 cm

Advantages of the HOPKINS® Laparoscopic Telescopes:
- Two and a half times greater image brightness
- Uniform image brightness, i.e. no reduction in luminous intensity from the center to the margin of the image
- Lower risk of object burns, i.e. the telescope requires a lower lamp output for the same perception of brightness
- Increased resolution of detail

ENDOCAMELEON® HOPKINS® Telescope

diameter 10 mm, length 32 cm,
autoclavable,
variable direction of view from 0°–120°,
adjustment knob for selecting the desired direction of view,
fiber optic light transmission incorporated,
color code: gold
Trocars and Accessories
Size 6 mm, 11 mm and 13 mm

30160 MP  Trocar, with pyramidal tip, insufflation stopcock, multifunctional valve, size 6 mm, working length 10.5 cm, color code: black, including:
  Trocar only, with pyramidal tip
  Cannula, without valve, with insufflation stopcock
  Multifunctional Valve, size 6 mm

30103 MP  Trocar, with pyramidal tip, insufflation stopcock, multifunctional valve, size 11 cm, working length 10.5 cm, color code: green, including:
  Trocar only, with pyramidal tip
  Cannula, without valve, with insufflation stopcock
  Multifunctional Valve, size 11 mm

30107 MP  Trocar, with pyramidal tip, insufflation stopcock, multifunctional valve, size 13 mm, working length 11.5 cm, color code: black, including:
  Trocar only, with pyramidal tip
  Cannula, without valve, with insufflation stopcock
  Multifunctional Valve, size 13 mm

30141 DB  Reducer, 11/5 mm

30142 HB  Double Reducer, 13/10 mm, 13.5/10 mm, 13/5 mm and 13.5/5 mm
Dissecting and Grasping Forceps, Scissors

CLICKLINE - rotational, can be dismantled, insulated, with and without connector pin for unipolar coagulation, size 5 mm, trocar size 6 mm

<table>
<thead>
<tr>
<th>Working length</th>
<th>Handle 33151</th>
<th>Handle 33125</th>
<th>Handle 33122</th>
<th>Handle 33152</th>
<th>Handle 33161</th>
<th>Handle 33133</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Double-action jaws:**

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Catalog number for the complete instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CLICKLINE KELLY Dissecting and Grasping Forceps</td>
</tr>
<tr>
<td>33210 MD</td>
<td>33251 MD 33225 MD 33222 MD 33252 MD 33261 MD 33233 MD</td>
</tr>
<tr>
<td>33310 MD</td>
<td>33351 MD 33325 MD 33322 MD 33352 MD 33361 MD 33333 MD</td>
</tr>
<tr>
<td>33410 MD</td>
<td>33451 MD 33425 MD 33422 MD 33452 MD 33461 MD 33433 MD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Catalog number for the complete instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CLICKLINE Dissecting Forceps, right angled</td>
</tr>
<tr>
<td>33210 R</td>
<td>33251 R 33225 R 33222 R 33252 R 33261 R 33233 R</td>
</tr>
<tr>
<td>33310 R</td>
<td>33351 R 33325 R 33322 R 33352 R 33361 R 33333 R</td>
</tr>
<tr>
<td>33410 R</td>
<td>33451 R 33425 R 33422 R 33452 R 33461 R 33433 R</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Catalog number for the complete instrument</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>CLICKLINE MANHES Grasping Forceps, “tiger-jaws”, 2x 4 teeth, for grasping and removal of solid organs, in particular during adhesiolyses</td>
</tr>
<tr>
<td>33210 MG</td>
<td>33251 MG 33225 MG 33222 MG 33252 MG 33261 MG 33233 MG</td>
</tr>
<tr>
<td>33310 MG</td>
<td>33351 MG 33325 MG 33322 MG 33352 MG 33361 MG 33333 MG</td>
</tr>
<tr>
<td>33410 MG</td>
<td>33451 MG 33425 MG 33422 MG 33452 MG 33461 MG 33433 MG</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Catalog number for the complete instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CLICKLINE METZENBAUM Scissors, curved, length of blades 12 mm</td>
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<tr>
<td>34210 MS</td>
<td>33251 MS 33225 MS 33222 MS 33252 MS 34261 MS</td>
</tr>
<tr>
<td>34310 MS</td>
<td>33351 MS 33325 MS 33322 MS 33352 MS 34361 MS</td>
</tr>
<tr>
<td>34410 MS</td>
<td>33451 MS 33425 MS 33422 MS 33452 MS 34461 MS</td>
</tr>
</tbody>
</table>

**Please note:**
For CLICKLINE instruments only the **individual component parts** are numbered. The catalog number for the **complete instrument** is not on the instrument. Instruments with **insulated handles** with connector pin for unipolar coagulation, are shown against the **red background**, instruments with **handles without connector pin for unipolar coagulation** are shown against the **blue background**. The colour **green** indicates the inserts.
Dissecting and Grasping Forceps
CLICKLINE – rotating, dismantling, without connector pin for unipolar coagulation
size 10 mm, trocar size 11 mm

Double-action jaws:

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Catalog number for the complete instrument</th>
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<tbody>
<tr>
<td>33510 RG</td>
<td>33561 RG 33532 RG 33533 RG</td>
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<tr>
<td>33510 PR</td>
<td>33561 PR 33532 PR 33533 PR</td>
</tr>
<tr>
<td>33510 MLL</td>
<td>33561 MLL 33532 MLL 33533 MLL</td>
</tr>
</tbody>
</table>

Please note:
For CLICKLINE instruments only the individual component parts are numbered. The catalog number for the complete instrument is not on the instrument. Instruments with handles without connector pin for unipolar coagulation are shown against the blue background. The colour green indicates the inserts.
RoBi® Bipolar Grasping Forceps and Scissors

RoBi® – rotational, can be dismantle
with connector pin for bipolar coagulation, CLERMONT-FERRAND Model,
size 5 mm, trocar size 6 mm

<table>
<thead>
<tr>
<th>Working Length</th>
<th>Handle</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 cm</td>
<td>38151</td>
</tr>
<tr>
<td>43 cm</td>
<td></td>
</tr>
</tbody>
</table>

Double-action jaws:

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Catalog number for the complete instrument</th>
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<tbody>
<tr>
<td>38610 ON</td>
<td>38651 ON</td>
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<tr>
<td>38710 ON</td>
<td>38751 ON</td>
</tr>
</tbody>
</table>

RoBi® Grasping Forceps, CLERMONT-FERRAND Model, fenestrated, with especially fine atraumatic serration

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Catalog number for the complete instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>38610 MW</td>
<td>38651 MW</td>
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<tr>
<td>38710 MW</td>
<td>38751 MW</td>
</tr>
<tr>
<td></td>
<td>38851 MW</td>
</tr>
</tbody>
</table>

KELLY RoBi® Grasping Forceps, CLERMONT-FERRAND Model, especially suitable for dissection

Please note:

For RoBi® Bipolar Grasping Forceps instruments only the individual component parts are numbered. The catalog number for the complete instrument, as shown above against the red background is not on the instrument. The colour green indicates the inserts.
Irrigation and Suction Tube
Size 5 mm

26173 BN  

Suction and Irrigation Tube, anti-reflex surface, with two-way stopcock, for single hand control, size 5 mm, length 36 cm

Surgical Sponge Holder
Size 5 mm

Special Features:
- Ergonomically designed handle for optimal functionality
- Shape of the jaws designed to fit surgical sponges
- Special locking mechanism

The instrument may be used as an atraumatic retractor and for blunt dissection. The sponge can easily be replaced by push-button control. The straight handle provides for optimal freedom of motion in any direction or plane.

32340 PT

Surgical Sponge Holder, for atraumatic dissection of tissue layers, size 5 mm, length 30 cm including:
- Handle
- Outer Sheath, insulated
- Sponge Holder Insert
RASSWEILER **Needle Holder**  
*Size 5 mm*

26173 SKG  
RASSWEILER **Needle Holder**, straight jaws, axial ring handle with ratchet, size 5 mm, length 33 cm, for use with suture material 2/0 – 4/0, needle size RB (Ethicon)

26173 SKL  
RASSWEILER **Needle Holder**, convex/concave, slim jaws, curved left, axial ring handle with ratchet, size 5 mm, length 33 cm, for use with suture material 3/0, needle size RB-1 (Ethicon)

---

RASSWEILER **Transurethral Bougie**  
*Size 18 Fr.*

27566 BL  
RASSWEILER **Transurethral Bougie** 18 Fr., with working channel 9 Fr., for anastomosis during laparoscopic prostatectomy
KOH Macro Needle Holder NEW
dismantable

KOH Macro Needle Holder, size 5 mm, dismantling, including:
- Handle
- Outer Sheath
- Working Insert

Cleaning and sterilization are gaining increasing importance for KARL STORZ as a manufacturer of surgical instruments.

Similar to all our surgical instruments, the cleaning and hygiene of our needle holders also play an important role. Our KOH macro needle holders feature consistent effectiveness and precision, with significantly improved cleaning results achieved by dismantling the instrument. The handle, outer sheath and inner part can be cleaned and sterilized separately for perfect results.

This unique reusable three-piece design offers the user the following benefits:
- Can be disassembled into three separate components
- Fully autoclavable
- Cleaning adaptor
- Choice of six different handles and three different working inserts
- With tungsten carbide inserts
- Environmentally correct: In the event of damage, only the component with the defect needs to be replaced
- User-friendly and ergonomic handling
**Handles and Outer Tubes**

*NEW*

**KOH Macro Needle Holders, dismantable**

Handles axial and pistol grip with disengageable ratchet

- **30173 AR** Handle, axial, with disengageable ratchet, ratchet release on the right side
- **30173 AL** Handle, axial, with disengageable ratchet, ratchet release on the left side
- **30173 AO** Handle, axial, with disengageable ratchet, ratchet release on top
- **30173 PR** Handle, pistol grip, with disengageable ratchet, ratchet release on the right side
- **30173 PL** Handle, pistol grip, with disengageable ratchet, ratchet release on the left side
- **30173 PO** Handle, pistol grip, with disengageable ratchet, ratchet release on top

**Metal Outer Sheath**

Size 5 mm

- **30173 A** Metal Outer Sheath, Size 5 mm with Luer-Lock connector for cleaning

<table>
<thead>
<tr>
<th>Length</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>33 cm</td>
<td>30173 A</td>
</tr>
<tr>
<td>43 cm</td>
<td>30178 A</td>
</tr>
</tbody>
</table>
### KOH Macro Needle Holder

**dismantable**

**Size 5 mm**

<table>
<thead>
<tr>
<th>Working Length</th>
<th>Handle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30173 AR</td>
</tr>
<tr>
<td>33 cm</td>
<td></td>
</tr>
<tr>
<td>43 cm</td>
<td></td>
</tr>
</tbody>
</table>

#### Single-action jaws

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Complete Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>30173 R</td>
<td>30173 RAR, 30173 RAL, 30173 RAO</td>
</tr>
<tr>
<td>30178 R</td>
<td>30178 RAR, 30178 RAL, 30178 RAO</td>
</tr>
</tbody>
</table>

KOH Macro Needle Holder, dismantling, jaws curved to right, with tungsten carbide inserts, for use with suture material size 0/0 – 7/0

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Complete Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>30173 L</td>
<td>30173 LAR, 30173 LAL, 30173 LAO</td>
</tr>
<tr>
<td>30178 L</td>
<td>30178 LAR, 30178 LAL, 30178 LAO</td>
</tr>
</tbody>
</table>

KOH Macro Needle Holder, dismantling, jaws curved to left, with tungsten carbide inserts, for use with suture material size 0/0 – 7/0

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Complete Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>30173 F</td>
<td>30173 FAR, 30173 FAL, 30173 FAO</td>
</tr>
<tr>
<td>30178 F</td>
<td>30178 FAR, 30178 FAL, 30178 FAO</td>
</tr>
</tbody>
</table>

KOH Macro Needle Holder, dismantling, straight jaws, with tungsten carbide inserts, for use with suture material size 0/0 – 7/0

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Complete Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>30173 G</td>
<td>30173 GAR, 30173 GAL, 30173 GAO</td>
</tr>
<tr>
<td>30173 GPR</td>
<td>30173 GPL, 30173 GPO</td>
</tr>
</tbody>
</table>

Working Insert, for KOH dismantling needle holder, straight, diameter 5 mm, length 33 cm, for use with suture material size USP 0 to 5-0
### KOH Macro Needle Holder NEW
dismantable

#### Size 5 mm

<table>
<thead>
<tr>
<th>Working Length</th>
<th>Handle</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 cm</td>
<td>30173 PR</td>
</tr>
<tr>
<td></td>
<td>30173 PL</td>
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<tr>
<td>43 cm</td>
<td>30173 PO</td>
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### Single-action jaws

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Complete Instrument</th>
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<tbody>
<tr>
<td>30173 R</td>
<td>30173 RPR 30173 RPL 30173 RPO</td>
</tr>
<tr>
<td>30178 R</td>
<td>30178 RPR 30178 RPL 30178 RPO</td>
</tr>
</tbody>
</table>

KOH Macro Needle Holder, dismantling, jaws curved to right, with tungsten carbide inserts, for use with suture material size 0/0 – 7/0

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Complete Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>30173 L</td>
<td>30173 LPR 30173 LPL 30173 LPO</td>
</tr>
<tr>
<td>30178 L</td>
<td>30178 LPR 30178 LPL 30178 LPO</td>
</tr>
</tbody>
</table>

KOH Macro Needle Holder, dismantling, jaws curved to left, with tungsten carbide inserts, for use with suture material size 0/0 – 7/0

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Complete Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>30173 F</td>
<td>30173 FPR 30173 FPL 30173 FPO</td>
</tr>
<tr>
<td>30178 F</td>
<td>30178 FPR 30178 FPL 30178 FPO</td>
</tr>
</tbody>
</table>

KOH Macro Needle Holder, dismantling, straight jaws, with tungsten carbide inserts, for use with suture material size 0/0 – 7/0
KOH Macro Needle Holders
dismantling, size 5 mm, trocars size 11 mm
Multiple puncture approach
Operating instruments, length 33,
for use with trocars size 6 mm or 11 mm with reduction sleeve

Special features:
- Tungsten carbide inserts for firmly and reliably needle positioning as well as long durability
- Easy going, precisely adjustable ratchet for easy and safe positioning of the needle
- Ergonomically designed handle for relaxed work
- Needle sizes BV, SH or CT1

The ergonomic properties of the new 5 mm KOH macro needle holder allow for precise holding of the needles and the thread. The precision branches and the new locking mechanism enable easy and precise guidance of the needle with threads of thickness 7 – 0 and 0 – 0.

26173 KAF  KOH Macro Needle Holder, with tungsten carbide insert, ergonomic straight handle, with disengageable ratchet, ratchet position right, jaws straight, size 5 mm, length 33 cm, for use with suture material size 0/0 to 7/0 and needle sizes BV, SH or CT-1

26173 KAR  Same, ratchet position left, jaws curved to right

26173 KAL  Same, ratchet position right, jaws curved to left

Please note:
Using the needle holder with a needle larger than recommended may result in a mechanical damage to the instrument.
Extraperitoneal Retrograde Laparoscopic Radical Prostatectomy

IMAGE1 S Camera System

Economical and future-proof
- Modular concept for flexible, rigid and 3D endoscopy as well as new technologies
- Forward and backward compatibility with video endoscopes and FULL HD camera heads

Innovative Design
- Dashboard: Complete overview with intuitive menu guidance
- Live menu: User-friendly and customizable
- Intelligent icons: Graphic representation changes when settings of connected devices or the entire system are adjusted

- Automatic light source control
- Side-by-side view: Parallel display of standard image and the Visualization mode
- Multiple source control: IMAGE1 S allows the simultaneous display, processing and documentation of image information from two connected image sources, e.g., for hybrid operations

Dashboard

Live menu

Intelligent icons

Side-by-side view: Parallel display of standard image and Visualization mode
**IMAGE1 S Camera System**

**Brilliant Imaging**
- Clear and razor-sharp endoscopic images in FULL HD
- Natural color rendition

**• Reflection is minimized**
- Multiple IMAGE1 S technologies for homogeneous illumination, contrast enhancement and color shifting

---

**FULL HD image**

**CLARA**

**FULL HD image**

**CHROMA**

**FULL HD image**

**SPECTRA A**

**SPECTRA B**

* SPECTRA A: Not for sale in the U.S.
** SPECTRA B: Not for sale in the U.S.
Extraperitoneal Retrograde Laparoscopic Radical Prostatectomy

**IMAGE1 S Camera System**

**TC 200EN**

**TC 200EN**

**IMAGE1 S CONNECT**, connect module, for use with up to 3 link modules, resolution 1920 x 1080 pixels, with integrated KARL STORZ-SCB and digital Image Processing Module, power supply 100–120 VAC/200–240 VAC, 50/60 Hz including:

- **Mains Cord**, length 300 cm
- **DVI-D Connecting Cable**, length 300 cm
- **SCB Connecting Cable**, length 100 cm
- **USB Flash Drive**, 32 GB, USB silicone keyboard, with touchpad, US

*Available in the following languages*: DE, ES, FR, IT, PT, RU

**Specifications:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>TC 200EN</th>
<th>Power supply</th>
<th>Power frequency</th>
<th>Protection class</th>
<th>Dimensions w x h x d</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD video outputs</td>
<td>2x DVI-D, 1x 3G-SDI</td>
<td>100–120 VAC/200–240 VAC</td>
<td>50/60 Hz</td>
<td>I, CF-Defib</td>
<td>305 x 54 x 320 mm</td>
<td>2.1 kg</td>
</tr>
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<td>Format signal outputs</td>
<td>1920 x 1080p, 50/60 Hz</td>
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<tr>
<td>LINK video inputs</td>
<td>3x</td>
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<td></td>
<td></td>
<td></td>
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<td>USB interface</td>
<td>4x USB, (2x front, 2x rear)</td>
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<tr>
<td>SCB interface</td>
<td>2x 6-pin mini-DIN</td>
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</tbody>
</table>

**For use with IMAGE1 S**

**IMAGE1 S CONNECT Module TC 200EN**

**TC 300**

**TC 300**

**IMAGE1 S H3-LINK**, link module, for use with IMAGE1 FULL HD three-chip camera heads, power supply 100–120 VAC/200–240 VAC, 50/60 Hz, for use with IMAGE1 S CONNECT TC 200EN including:

- **Mains Cord**, length 300 cm
- **Link Cable**, length 20 cm

**Specifications:**

<table>
<thead>
<tr>
<th>Camera System</th>
<th>TC 300 (H3-Link)</th>
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</thead>
<tbody>
<tr>
<td>Supported camera heads/video endoscopes</td>
<td>TH 100, TH 101, TH 102, TH 103, TH 104, TH 106 (fully compatible with IMAGE1 S) 22220055-3, 22220056-3, 22220053-3, 22220060-3, 22220061-3, 22220054-3, 22220085-3 (compatible without IMAGE1 S technologies CLARA, CHROMA, SPECTRA*)</td>
</tr>
<tr>
<td>LINK video outputs</td>
<td>1x</td>
</tr>
<tr>
<td>Power supply</td>
<td>100–120 VAC/200–240 VAC</td>
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<tr>
<td>Power frequency</td>
<td>50/60 Hz</td>
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<tr>
<td>Protection class</td>
<td>I, CF-Defib</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>305 x 54 x 320 mm</td>
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<tr>
<td>Weight</td>
<td>1.86 kg</td>
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</table>

* SPECTRA A: Not for sale in the U.S.
** SPECTRA B: Not for sale in the U.S.
IMAGE1 S Camera Heads

For use with IMAGE1 S Camera System
IMAGE1 S CONNECT Module TC 200EN, IMAGE1 S H3-LINK Module TC 300
and with all IMAGE1 HUB™ HD Camera Control Units

TH 100

IMAGE1 S H3-Z Three-Chip FULL HD Camera Head, 50/60 Hz, IMAGE1 S compatible, progressive scan, soakable, gas- and plasma-sterilizable, with integrated Parfocal Zoom Lens, focal length \( f = 15-31 \text{ mm} \) (2x), 2 freely programmable camera head buttons, for use with IMAGE1 S and IMAGE1 HUB™ HD/HD

TH 103

IMAGE1 S H3-P Three-Chip FULL HD Pendulum Camera Head, 50/60 Hz, IMAGE1 S compatible, with pendulum system and fixed focus, progressive scan, soakable, gas- and plasma-sterilizable, focal length \( f = 16 \text{ mm} \), 2 freely programmable camera head buttons, for use with IMAGE1 S and IMAGE1 HUB™ HD/HD

Specifications:

<table>
<thead>
<tr>
<th>IMAGE1 FULL HD Camera Heads</th>
<th>IMAGE1 S H3-Z</th>
<th>IMAGE1 S H3-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product no.</td>
<td>TH 100</td>
<td>TH 103</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x 1/3” CCD chip</td>
<td>3x 1/3” CCD chip</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>39 x 49 x 114 mm</td>
<td>35 x 47 x 88 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>270 g</td>
<td>226 g</td>
</tr>
<tr>
<td>Optical interface</td>
<td>integrated Parfocal Zoom Lens, ( f = 15-31 \text{ mm} ) (2x)</td>
<td>pendulum system, fixed focus ( f = 16 \text{ mm} )</td>
</tr>
<tr>
<td>Min. sensitivity</td>
<td>F 1.4/1.17 Lux</td>
<td>F 1.4/1.17 Lux</td>
</tr>
<tr>
<td>Grip mechanism</td>
<td>standard eyepiece adaptor</td>
<td>standard eyepiece adaptor</td>
</tr>
<tr>
<td>Cable</td>
<td>non-detachable</td>
<td>non-detachable</td>
</tr>
<tr>
<td>Cable length</td>
<td>300 cm</td>
<td>300 cm</td>
</tr>
</tbody>
</table>
### IMAGE1 S Camera Heads

For use with IMAGE1 S Camera System

**IMAGE1 S CONNECT Module TC 200EN, IMAGE1 S H3-LINK Module TC 300**

and with all IMAGE1 HUB™ HD Camera Control Units

#### TH 104

**IMAGE1 S H3-ZA Three-Chip FULL HD Camera Head**, 50/60 Hz, IMAGE1 S compatible, **autoclavable**, progressive scan, soakable, gas- and plasma-sterilizable, with integrated Parfocal Zoom Lens, focal length f = 15–31 mm (2x), 2 freely programmable camera head buttons, for use with IMAGE1 S and IMAGE1 HUB™ HD/HD

**Specifications:**

<table>
<thead>
<tr>
<th>IMAGE1 FULL HD Camera Heads</th>
<th>IMAGE1 S H3-ZA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product no.</td>
<td>TH 104</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x 1/3” CCD chip</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>39 x 49 x 100 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>299 g</td>
</tr>
<tr>
<td>Optical interface</td>
<td>integrated Parfocal Zoom Lens, f = 15–31 mm (2x)</td>
</tr>
<tr>
<td>Min. sensitivity</td>
<td>F 1.4/1.17 Lux</td>
</tr>
<tr>
<td>Grip mechanism</td>
<td>standard eyepiece adaptor</td>
</tr>
<tr>
<td>Cable</td>
<td>non-detachable</td>
</tr>
<tr>
<td>Cable length</td>
<td>300 cm</td>
</tr>
</tbody>
</table>

#### 39301 Z3TS

**Plastic Container for Sterilization and Storage**

of camera heads IMAGE1 H3-Z, H3-ZA, H3-FA, IMAGE1 S H3-Z, H3-ZA and H3-FA, **autoclavable**, suitable for use with steam, gas and hydrogen peroxide sterilization, Sterrad® compatible, external dimensions (w x d x h): 385 x 255 x 75 mm

**Please note:** The instrument displayed is not included in the plastic container. Only camera heads marked “autoclavable” can be placed in the tray for steam sterilization.

#### 39301 PHTS

**Plastic Container for Sterilization and Storage**

of camera heads IMAGE1 H3-P, H3-Zl, IMAGE1 S H3-P and H3-Zl, **autoclavable**, suitable for use with steam, gas and hydrogen peroxide sterilization, Sterrad® compatible, external dimensions (w x d x h): 385 x 255 x 75 mm

**Please note:** The instrument displayed is not included in the plastic container. Only camera heads marked “autoclavable” can be placed in the tray for steam sterilization.
Monitors

- **9619 NB**
  - 19" HD Monitor,
    - color systems PAL/NTSC
    - max. screen resolution 1280 x 1024
    - image format 4:3
    - power supply 100–240 VAC, 50/60 Hz
    - wall-mounted with VESA 100 adaption
    - including:
      - External 24 VDC Power Supply
      - Mains Cord

- **9826 NB**
  - 26" FULL HD Monitor,
    - wall-mounted with VESA 100 adaption
    - color systems PAL/NTSC
    - max. screen resolution 1920 x 1080
    - image format 16:9
    - power supply 100–240 VAC, 50/60 Hz
    - including:
      - External 24 VDC Power Supply
      - Mains Cord
### Monitors

<table>
<thead>
<tr>
<th>KARL STORZ HD and FULL HD Monitors</th>
<th>19&quot;</th>
<th>26&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall-mounted with VESA 100 adaption</td>
<td>9619 NB</td>
<td>9826 NB</td>
</tr>
</tbody>
</table>

**Inputs:**
- DVI-D: ●
- Fibre Optic: –
- 3G-SDI: –
- RGBS (VGA): ●
- S-Video: ●
- Composite/FBAS: ●

**Outputs:**
- DVI-D: ●
- S-Video: ●
- Composite/FBAS: ●
- RGBS (VGA): ●
- 3G-SDI: –

**Signal Format Display:**
- 4:3: ●
- 5:4: ●
- 16:9: ●
- Picture-in-Picture: ●
- PAL/NTSC compatible: ●

**Optional accessories:**
- 9826 SF: Pedestal, for monitor 9826 NB
- 9626 SF: Pedestal, for monitor 9619 NB

**Specifications:**

<table>
<thead>
<tr>
<th>KARL STORZ HD and FULL HD Monitors</th>
<th>19&quot;</th>
<th>26&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop with pedestal: optional</td>
<td>optional</td>
<td></td>
</tr>
<tr>
<td>Product no.: 9619 NB</td>
<td>9826 NB</td>
<td></td>
</tr>
<tr>
<td>Brightness: 200 cd/m² (typ)</td>
<td>500 cd/m² (typ)</td>
<td></td>
</tr>
<tr>
<td>Max. viewing angle: 178° vertical</td>
<td>178° vertical</td>
<td></td>
</tr>
<tr>
<td>Pixel distance: 0.29 mm</td>
<td>0.3 mm</td>
<td></td>
</tr>
<tr>
<td>Reaction time: 5 ms</td>
<td>8 ms</td>
<td></td>
</tr>
<tr>
<td>Contrast ratio: 700:1</td>
<td>1400:1</td>
<td></td>
</tr>
<tr>
<td>Mount: 100 mm VESA</td>
<td>100 mm VESA</td>
<td></td>
</tr>
<tr>
<td>Weight: 7.6 kg</td>
<td>7.7 kg</td>
<td></td>
</tr>
<tr>
<td>Rated power: 28 W</td>
<td>72 W</td>
<td></td>
</tr>
<tr>
<td>Operating conditions: 0–40°C</td>
<td>5–35°C</td>
<td></td>
</tr>
<tr>
<td>Storage: -20–60°C</td>
<td>-20–60°C</td>
<td></td>
</tr>
<tr>
<td>Rel. humidity: max. 85%</td>
<td>max. 85%</td>
<td></td>
</tr>
<tr>
<td>Dimensions w x h x d: 469.5 x 416 x 75.5 mm</td>
<td>643 x 396 x 87 mm</td>
<td></td>
</tr>
<tr>
<td>Power supply: 100–240 VAC</td>
<td>100–240 VAC</td>
<td></td>
</tr>
<tr>
<td>Certified to: EN 60601-1, protection class IPX0</td>
<td>EN 60601-1, UL 60601-1, MDD93/42/EEC, protection class IPX2</td>
<td></td>
</tr>
</tbody>
</table>
Data Management and Documentation
KARL STORZ AIDA® – Exceptional documentation

The name AIDA stands for the comprehensive implementation of all documentation requirements arising in surgical procedures: A tailored solution that flexibly adapts to the needs of every specialty and thereby allows for the greatest degree of customization.

This customization is achieved in accordance with existing clinical standards to guarantee a reliable and safe solution. Proven functionalities merge with the latest trends and developments in medicine to create a fully new documentation experience – AIDA.

AIDA seamlessly integrates into existing infrastructures and exchanges data with other systems using common standard interfaces.

WD 200-XX* AIDA Documentation System, for recording still images and videos, dual channel up to FULL HD, 2D/3D, power supply 100-240 VAC, 50/60 Hz
including:
USB Silicone Keyboard, with touchpad
ACC Connecting Cable
DVI Connecting Cable, length 200 cm
HDMI-DVI Cable, length 200 cm
Mains Cord, length 300 cm

WD 250-XX* AIDA Documentation System, for recording still images and videos, dual channel up to FULL HD, 2D/3D, including SMARTSCREEN® (touch screen), power supply 100-240 VAC, 50/60 Hz
including:
USB Silicone Keyboard, with touchpad
ACC Connecting Cable
DVI Connecting Cable, length 200 cm
HDMI-DVI Cable, length 200 cm
Mains Cord, length 300 cm

*XX Please indicate the relevant country code (DE, EN, ES, FR, IT, PT, RU) when placing your order.
Workflow-oriented use

**Patient**
Entering patient data has never been this easy. AIDA seamlessly integrates into the existing infrastructure such as HIS and PACS. Data can be entered manually or via a DICOM worklist. All important patient information is just a click away.

**Checklist**
Central administration and documentation of time-out. The checklist simplifies the documentation of all critical steps in accordance with clinical standards. All checklists can be adapted to individual needs for sustainably increasing patient safety.

**Record**
High-quality documentation, with still images and videos being recorded in FULL HD and 3D. The Dual Capture function allows for the parallel (synchronous or independent) recording of two sources. All recorded media can be marked for further processing with just one click.

**Edit**
With the Edit module, simple adjustments to recorded still images and videos can be very rapidly completed. Recordings can be quickly optimized and then directly placed in the report. In addition, freeze frames can be cut out of videos and edited and saved. Existing markings from the Record module can be used for quick selection.

**Complete**
Completing a procedure has never been easier. AIDA offers a large selection of storage locations. The data exported to each storage location can be defined. The Intelligent Export Manager (IEM) then carries out the export in the background. To prevent data loss, the system keeps the data until they have been successfully exported.

**Reference**
All important patient information is always available and easy to access. Completed procedures including all information, still images, videos, and the checklist report can be easily retrieved from the Reference module.
Accessories for Video Documentation

For use with telescopes, diameter 10 mm:
495 NCS  **Fiber Optic Light Cable,**
with straight connector, extremely heat-resistant,
diameter 4.8 mm, length 250 cm

For use with telescopes, diameter 5 mm:
4495 NA  **Fiber Optic Light Cable,**
with straight connector,
diameter 3.5 mm, length 230 cm

Cold Light Fountain XENON 300 SCB

2013101-1  **Cold Light Fountain XENON 300 SCB**
with built-in antifog air-pump, and integrated
KARL STORZ Communication Bus System SCB
power supply:
100–125 VAC/220–240 VAC, 50/60 Hz
including:
**Mains Cord**
**SCB Connecting Cable,** length 100 cm
20133027  **Spare Lamp Module XENON**
with heat sink, 300 watt, 15 volt
20133028  **XENON Spare Lamp,** only,
300 watt, 15 volt

Cold Light Fountain XENON NOVA® 175

20131501  **Cold Light Fountain XENON NOVA® 175**
power supply:
100–125 VAC/220–240 VAC, 50/60 Hz
including:
**Mains Cord**
20132026  **XENON Spare Lamp,** only,
175 watt, 15 volt
ENDOFLATOR® 40 with KARL STORZ SCB
with High Flow Insufflation (40 l/min.)

ENDOFLATOR® 40 SCB,
Set, with integrated SCB module,
power supply 100 - 240 VAC, 50/60 Hz
including:
ENDOFLATOR® 40
Mains Cord, length 300 cm
SCB Connecting Cable, length 100 cm
Universal Wrench
Insufflation Tubing Set, with gas filter, sterile,
for single use, package of 5*

Subject to the customer's application-specific requirements additional accessories must be ordered separately.

This product is marketed by mtp.
For additional information, please apply to
mtp medical technical promotion gmbh,
Take-Off Gewerbepark 46,
D-78579 Neuhausen ob Eck, Germany

THERMOFLATOR® with KARL STORZ SCB
with High Flow Insufflation (30 l/min.)

26 4320 08-1 THERMOFLATOR® SCB
including:
THERMOFLATOR® with KARL STORZ SCB
power supply 100 – 240 VAC, 50/60 Hz
Mains Cord
OPTITHERM® Heating Element, sterilizable
Silicone Tubing Set, sterilizable
Universal Wrench
SCB Connecting Cable, length 100 cm
* CO₂/N₂O Gas Filter, sterile,
for single use, package of 10

Subject to the customer's application-specific requirements additional accessories must be ordered separately.

This product is marketed by mtp.
For additional information, please apply to
mtp medical technical promotion gmbh,
Take-Off Gewerbepark 46,
D-78579 Neuhausen ob Eck, Germany
DUOMAT®
Suction and Irrigation Pump

DUOMAT®
Suction and Irrigation Pump,
including:
- DUOMAT®,
  power supply 100 – 120,
  230 – 240 VAC, 50/60 Hz
- Mains Cord
- ‘VACUsafe Promotion
  Pack Suction, 2 l
  (not illustrated)

Subject to the customer’s application-specific requirements additional accessories must be ordered separately.

* This product is marketed by mtp.
For additional information, please apply to:

mtp medical technical promotion gmbh,
Take-Off Gewerbepark 46,
D-78579 Neuhausen ob Eck, Germany

HAMOU® ENDOMAT® with KARL STORZ SCB
Suction and Irrigation System

HAMOU® ENDOMAT® SCB,
power supply 100 – 240 VAC, 50/60 Hz
including:
- Mains Cord
- 5x HYST Tubing Set*, for single use
- 5x LAP Tubing Set*, for single use
- SCB Connecting Cable, length 100 cm
- VACUsafe Promotion Pack Suction*, 2 l

Subject to the customer’s application-specific requirements additional accessories must be ordered separately.

* This product is marketed by mtp.
For additional information, please apply to:

mtp medical technical promotion gmbh,
Take-Off Gewerbepark 46,
D-78579 Neuhausen ob Eck, Germany
**Equipment Cart**

**Equipment Cart**
wide, high, rides on 4 antistatic dual wheels equipped with locking brakes 3 shelves, mains switch on top cover, central beam with integrated electrical subdistributors with 12 sockets, holder for power supplies, potential earth connectors and cable winding on the outside.

*Dimensions:*
- Equipment cart: 830 x 1474 x 730 mm (w x h x d),
- shelf: 630 x 510 mm (w x d),
- caster diameter: 150 mm

including:
- **Base module equipment cart**, wide
- **Cover equipment**, equipment cart wide
- **Beam package equipment**, equipment cart high
- 3x **Shelf**, wide
- **Drawer unit with lock**, wide
- 2x **Equipment rail**, long
- **Camera holder**

**Monitor Swivel Arm,**
height and side adjustable, can be turned to the left or the right side, swivel range 180°, overhang 780 mm, overhang from centre 1170 mm, load capacity max. 15 kg, with monitor fixation VESA 5/100, for usage with equipment carts UG xxx
Recommended Accessories for Equipment Cart

**UG 310**

**Isolation Transformer,**
200 V–240 V; 2000 VA with 3 special mains socket, expulsion fuses, 3 grounding plugs, dimensions: 330 x 90 x 495 mm (w x h x d), for usage with equipment carts UG xxx

**UG 410**

**Earth Leakage Monitor,**
200 V–240 V, for mounting at equipment cart, control panel dimensions: 44 x 80 x 29 mm (w x h x d), for usage with isolation transformer UG 310

**UG 510**

**Monitor Holding Arm,**
height adjustable, inclinable, mountable on left or right, turning radius approx. 320°, overhang 530 mm, load capacity max. 15 kg, monitor fixation VESA 75/100, for usage with equipment carts UG xxx
Notes:
Notes: