Reusable port for laparoscopic single portal surgery
Use of the reusable single access port system (X-Cone) for laparoscopic cholecystectomy

Prof. Dr. Christoph-Thomas GERMER
Direktor Universitätsklinikum Würzburg, Chirurgische Klinik I, Germany

Dr. med. Katica KRAJINOVIC
Universitätsklinikum Würzburg, Chirurgische Klinik I, Germany

I. Positioning of the patient

The patient is placed in a supine position, the legs are spread apart and both arms are secured. Foot supports must be attached to both feet. Side supports are also required for when the table is tilted laterally.

II. Positioning of the surgical team

The surgeon stands between the patient’s legs, the first assistant stands on the left-hand side of the patient (to the right of the surgeon). The scrub nurse stands on the patient’s right-hand side (to the left of the surgeon). The screen is positioned directly in front of the surgeon.
III. Assembly

- The X-CONE is assembled during the intervention.
- Place a white sealing cap on both of the insertion pieces (fig. 2). Insert the insertion pieces and insertion sleeve into the seal (fig. 3).
- Place the desired central sealing cap with the relevant diameter (5 mm / 10 mm / 12 mm) onto the insertion sleeve (fig. 4).
- Place a sealing cap on both of the seal’s flexible accesses (fig. 5).
- Place the silicone lip valve on the bottom of the seal on the insertion sleeve (fig. 6).
- Insert the first and then the second half of the X-CONE into the access opening.
- Fold both halves of the X-Cone together to form an access channel (fig. 7).
- Place the fully prepared seal on the access channel (fig. 8).
- If necessary, also attach a LUER lock connector for desufflation (fig. 9).
IV. The approach

An infraumbilical incision from 12 noon to 6 p.m. measuring 15 to 20 mm is made along the natural circumference of the umbilicus whilst sparing the actual insertion umbilicus (fig. 10).

Visualization of the fascia and open approach into the abdomen, the vertical fascial incision also measures 15 to 20 mm here (fig. 11).

Fascial holding sutures (Vicryl thickness 1) are then placed at the cranial and caudal ends of the fascial incision, the sutures are not knotted and secured with Kocher's forceps (fig. 12). Optical and digital inspection of the unimpeded approach.

Fig. 10: Marking of the vertical umbilicus incision
Fig. 11: Infraumbilical incision from 12 noon to 6 p.m
Fig. 12: Fascial holding suture
V. Positioning of the X-CONE

The first X-CONE half is inserted whilst pulling gently and uniformly on the holding sutures (fig. 13).

The second X-CONE half is now inserted under complete visual control whilst pulling on both fascial holding sutures. Closure of the inner part of the access system (fig. 14).

After correct positioning (ball bearings click into place), the tension on the fascial holding sutures is relieved and the outer working access of the port system is folded together (fig. 15). The X-CONE must be positioned with the insufflation stopcock at 12 noon.

Intracorporeal view of the X-CONE (fig. 16).

**TIP:**
Should it prove difficult to fold the port system together, it is recommended that the X-CONE be removed and that the skin or fascial incision be extended by a few millimeters.
VI. Instructions for positioning instruments for laparoscopic cholecystectomy

When viewed from above, we position the telescope on the far right, the holding instrument on the far left and the working instrument in the middle (fig. 17).

**TIP:**
The middle access can be reduced straight away to a 5 mm working port by using a reducer (fig. 18). In our hospital we use 10 mm titanium clips which can be easily inserted via the central working port at the relevant point during the intervention following removal of the reducer.
**TIP:**
The curved holding forceps should have a lockable handle which allows the instrument to be rotated. The aim is to use the curvature of the forceps to maximum effect in conjunction with rotation for the purpose of exposing the gallbladder (fig. 19).

![Fig. 19](image)

**TIP:**
The working instruments are positioned above and below each other in the port system. Should it be necessary to reposition the instruments, these must be retracted into the conical part of the X-Cone in order to prevent uncontrolled crowding (fig. 21, 22).

![Fig. 21](image)  ![Fig. 22](image)

**TIP:**
The sealing cap should be attached by two people together. The assistant should lift up the port system in order to prevent damage to the intestinal loops (fig. 20).

The sealing cap should be attached in such a way that the lateral flexible ports are aligned with the abutments.

![Fig. 20](image)

**TIP:**
For better exposure of the gallbladder 3 mm grasping forceps can also be used.
VII. Surgical steps for laparoscopic cholecystectomy

- Creation of the pneumoperitoneum.
- Upright positioning of the patient’s upper body.
- Introduction of the endoscope via the right lateral flexible seal port.
- Laparoscopy for orientation.
- Insertion of the curved grasping forceps into the left lateral flexible seal port and grasping of the gallbladder.
- Exposure of the gallbladder with the curved grasping forceps and 3 mm grasping forceps.
- Exposure of Calot’s triangle and dissection of the cystic duct and cystic artery using scissors.
- Placing of a 10 mm clip on the cystic duct and cystic artery via the middle trocar port.
- Transection of the structures using scissors and retrograde removal of the gallbladder from the gallbladder bed using the Metzenbaum scissors.
- Careful irrigation of the surgical area via the middle trocar port following attachment of the reducer.
- Insertion of the extraction bag via the middle trocar port.
- Extraction of the gallbladder (fig. 23).
• Removal of the port system: The single port must be removed whilst holding the fascial sutures tight (fig. 24, fig. 25).

• Placement of further fascial sutures in the area of the fascial incision which are then knotted one after the other.

• Irrigation of the wound bed and inspection to ensure bleeding has stopped.

• Subcutaneous sutures.

• Continuous, intracutaneous absorbable skin suturing.

• Attachment of a compression dressing.

• Final result (fig. 26).

VIII. Our experience

• For dissection in the area of the hepatoduodenal ligament in particular curved scissors or the KErLY dissecting and grasping forceps are ideal for making relatively atraumatic spreading of the tissue easier and for allowing the relevant anatomical structures to be selectively passed under.

• In order to reduce external 'clashes', the use of a long 30° telescope (diameter 5 mm, length 50 cm) creates more room for maneuver.

• If necessary, the additional insertion of 3 mm grasping forceps is sufficient to create an adequate overview.
Transumbilical single port cholecystectomy with X-CONE
Recommended set from the University of Würzburg, Germany

Access instrument

23020 PA

X-Cone Single Portal Surgery Access System (size 25 mm)
consisting of:

- 23020 P Port, size 25 mm,
  consisting of two half cones (23020P1/ 23020P2)
- 23020 SA Sealing, with 4 x 5 mm and 1 x 5-13 mm ports
- 23001 DB Reducer, 13/ 5 mm and 11/ 5 mm
- 23005 ID LUER-Lock-Connector with stopcock for
  insufflation and desufflation

Telescope

26048 BA

Hopkins® Forward-Oblique Telescope 30°,
diameter 5.5 mm, length 50 cm, autoclavable.
Fiber optic light transmission incorporated.
Color code: red
Grasping Forceps

35433 BAU CLICKliné Grasping Forceps, dismantling, rotating, jaws with multiple teeth, fenestrated, single action jaws, coaxial curved down, size 5 mm, length 43 cm, consisting of:
33133 Metal Handle, with hemostat style ratchet
35410 BAU Outer Sheath with working insert

Alternatively:
35433 AFU CLICKliné Grasping Forceps, rotating, dismantling, coaxial curved down, atraumatic, fenestrated, double action jaws, size 5 mm, length 43 cm, consisting of:
33133 Metal Handle, with hemostat style ratchet
35410 AFU Outer Sheath with Working Insert

33321 MD CLICKliné KELLY Dissecting and Grasping Forceps, rotating, with connector pin for unipolar coagulation, size 5 mm, length 36 cm, double action jaws, consisting of:
33121 Plastic Handle, without ratchet
33300 Outer Tube, insulated
33310 MD Forceps Insert
### Scissors

34321 MS **CLICKline METZENBAUM Scissors**, rotating, with connector pin for unipolar coagulation, size 5 mm, length 36 cm, blades curved, double action jaws, length of blades 12 mm, consisting of:

- 33121 **Insulated Handle**, without ratchet
- 33300 **Outer Tube**, insulated
- 34310 MS **Insert**

### Clip-Applicator

30444 LR **Clip Applicator**, for use with Pilling-Weck Titanium-Clips 30460 AL (medium large), dismantling, rotating, with ratchet to lock the jaw part holding the clip, size 10 mm, length 36 cm, consisting of:

- 30444 H **Metal Handle**, with ratchet
- 30444 A **Metal Outer Tube**
- 30440 LR **Insert**

### Suction and Irrigation Tube

26173 BN **Suction and Irrigation Tube**, anti-reflex surface with two-way stopcock, for single hand control, size 5 mm,
Additional Instruments

800001  DESCHAMPS Ligature Needle, length 20 cm, blunt, curved to right

801703  KOCHER-LANGENBECK Retractor, length 21.5 cm, size 35 mm x 11mm

Extraction Bag

040142-05* Disposable Extraction Bag, opening 10 cm, volume 800 ml, for use with 10 mm trocars, sterile, shipment unit 5 pieces

Additionally, straight standard laparoscopy instruments can be used.
Data Management and Documentation
KARL STORZ AIDA® compact NEO (HD/SD)
Brilliance in documentation continues!

AIDA compact NEO from KARL STORZ combines all the required functions for integrated and precise documentation of endoscopic procedures and open surgeries in a single system.

Data Acquisition
Still images, video sequences and audio comments can be recorded easily during an examination or intervention on command by either pressing the on screen button, voice control, foot switch or pressing the camera head button. All captured images will be displayed on the right hand side as a “thumbnail” preview to ensure the still image has been generated.

The patient data can be entered by the on-screen keyboard or by a standard keyboard.

Flexible post editing and data storage
Captured still images or video files can be previewed before final storage or can be edited and deleted easily in the edit screen.

Reliable storage of data
- Digital saving of all image, video and audio files on DVD, CD-ROM, USB stick, external/internal hard-drive or to the central hospital storage possibilities over DICOM/HL7
- Buffering ensures data backup if saving is temporarily not possible
- Continuous availability of created image, video and sound material for procedure documentation and for research and teaching purposes.

Efficient data archiving
After a procedure has been completed, KARL STORZ AIDA® compact HD/SD saves all captured data efficiently on DVD, CD-ROM, USB stick, external hard-drive, internal hard-drive and/or the respective network on the FTP server. Furthermore the possibility exists to store the data directly on the PACS respective HIS server, over the interface package AIDA communication HL7/DICOM.

Data that could not be archived successfully remains in a special buffered procedure until it is finally saved. A two-line report header and a logo can be used by the user to meet his or her needs.

Multisession and Multipatient
Efficient data archiving is assured as several treatments can be saved on a DVD, CD-ROM or a USB stick.
Features and Benefits

- Digital storage of still images with a resolution of 1920 x 1080 pixels, video sequences in 720p and audio files with AIDA compact NEO HD
- Optional interface package DICOM/HL7
- Sterile, ergonomic operation via touch screen, voice control, camera head buttons and/or foot switches
- Auto detection of the connected camera system on HD-SDI/SD-SDI input
- Efficient archiving on DVD, CD-ROM or USB stick, multi-session and multi-patient
- Network saving
- Automatic generation of standard reports
- Approved use of computers and monitors in the OR environment as per EN 60601-1
- Compatibility with the KARL STORZ Communication Bus (SCB) and with the KARL STORZ OR1™ AV NEO
- KARL STORZ AIDA® compact NEO HD/SD is an attractive, digital alternative to video printers, video recorders and dictaphones.

Specifications:

<table>
<thead>
<tr>
<th>Video Systems</th>
<th>Video Formats</th>
</tr>
</thead>
<tbody>
<tr>
<td>- PAL</td>
<td>- MPEG2</td>
</tr>
<tr>
<td>- NTSC</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signal Inputs</th>
<th>Audio Formats</th>
</tr>
</thead>
<tbody>
<tr>
<td>- S-Video (Y/C)</td>
<td>- WAV</td>
</tr>
<tr>
<td>- Composite</td>
<td></td>
</tr>
<tr>
<td>- RGBS</td>
<td></td>
</tr>
<tr>
<td>- SDI</td>
<td></td>
</tr>
<tr>
<td>- HD-SDI</td>
<td></td>
</tr>
<tr>
<td>- DVI</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Image Formats</th>
<th>Storage Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>- JPG</td>
<td>- DVD+R</td>
</tr>
<tr>
<td>- BMP</td>
<td>- DVD+RW</td>
</tr>
<tr>
<td></td>
<td>- DVD-R</td>
</tr>
<tr>
<td></td>
<td>- DVD-RW</td>
</tr>
<tr>
<td></td>
<td>- CD-R</td>
</tr>
<tr>
<td></td>
<td>- CD-RW</td>
</tr>
<tr>
<td></td>
<td>- USB stick</td>
</tr>
</tbody>
</table>
**IMAGE 1™ HD**

**HD hub Camera Control Unit**

- Maximum resolution and the consistent use of the 16:9 aspect ratio guarantee FULL HD
- Endoscopic camera systems have to be equipped with three-CCD chips that support the 16:9 input format as well as capturing images with a resolution of 1920 x 1080 pixels

The benefits of High Definition Technology (HD) for medical applications are
- Up to 6 times* higher input resolution of the camera delivers more detail and depth of focus
- Using 16:9 format during image acquisition enlarges the field of vision and supports ergonomic viewing
- The brilliance of color enables optimal diagnosis
- Lateral view is enhanced by 32% when the endoscope is withdrawn slightly, providing the same image enhancement as a standard system. Any vertical information loss is restored and the lens remains clean

**Specifications:**

<table>
<thead>
<tr>
<th>Signal-to-noise ratio</th>
<th>AGC</th>
<th>Video output</th>
<th>Input</th>
</tr>
</thead>
</table>
| IMAGE 1 HUB™ HD       | Micro-processor-controlled | - Composite signal to BNC socket  
- S-Video signal to 4-pin Mini DIN socket (2x)  
- RGBS signal to D-Sub socket  
- SDI signal to BNC socket (only IMAGE 1 HUB™ HD with SDI module)(2x)  
- HDTV signal to DVI-D socket (2x) | Keyboard for title generator, 5-pin DIN socket |
| Three-chip camera systems ≥ 60 dB |

**Control output /input**

- KARL STORZ-SCB® at 6-pin Mini DIN socket (2x)
- 3.5 mm stereo jack plug (ACC 1, ACC 2)
- Serial port at RJ-11
- USB port (only IMAGE 1 HUB™ HD with ICM) (2x)

- Dimensions: 305 x 89 x 335
- Weight (kg): 2.95
- Power supply: 100-240 VAC, 50/60 Hz

**Certified to:**

IEC 601-1, 601-2-18, CSA 22.2 No. 601, UL 2601-1 and CE acc. to MDD, protection class 1/CF

**SDI – Serial Digital Interface:** optimized to display medical images on Flat Screens, Routing with OR1™ and digital recording with AIDA-DVD-M

**ICM:** USB-connector for recording video streams and stills on USB storage media or for connection of USB printers for direct printing of the recorded stills
**IMAGE 1™ HD**

**HD Camera Head**

---

**Specifications:**

<table>
<thead>
<tr>
<th>Image sensor</th>
<th>3x 1/3” CCD-Chip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pixel output signal</td>
<td>1920 x 1080</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Diameter 32-44 mm, length 114 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>246 g</td>
</tr>
<tr>
<td>Min. sensitivity</td>
<td>F 1.4/1.17 Lux</td>
</tr>
<tr>
<td>Lens</td>
<td>Integrated Parfocal Zoom Lens, f = 15-31 mm</td>
</tr>
<tr>
<td>Grip mechanism</td>
<td>Standard eyepiece detector, non-detachable</td>
</tr>
<tr>
<td>Cable</td>
<td>300 cm</td>
</tr>
</tbody>
</table>

---

**KARL STORZ**

**HD Flat Screens**

**Color systems PAL/NTSC**

<table>
<thead>
<tr>
<th>Version</th>
<th>Order No.</th>
<th>Screen diagonal</th>
<th>Screen resolution</th>
<th>Max. screen resolution</th>
<th>Video input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall mounted with VESA 100-adaption</td>
<td>9524 NB</td>
<td>24”</td>
<td></td>
<td>1920 x 1200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9526 NB</td>
<td>26”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desktop with pedestal</td>
<td>9524 N</td>
<td>24”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9526 N</td>
<td>26”</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**The following accessories are included:**

- 400 A **Mains Cord**
- 9523 PS **External 24VDC Power Supply**
- 9419 SF **Pedestal**
Notes