

# The growing potential of LESS technology in the field of urology:

## LESS Surgery – NEW INNOVATIVE INSTRUMENTS FOR INNOVATIVE SURGERY

Continuous progress has been made during recent years in the field of urological surgeries. The technology has made an important developmental step forward from multiple-site to single-site incision interventions. With a growing number of incision sites, the potential for morbidity from bleeding, port-site hernia and internal organ damage is growing, together with a worsening of the cosmetic outcome<sup>1,2,3</sup>. LESS (Laparo-Endoscopic Single-Site) surgery allows access to surgical tissue through a single port with a single incision, thereby reducing access trauma and leading to nearly scar-free cosmetic results.

Since 2007, Laparo-Endoscopic Single-Site (LESS) surgery is routinely being used in general, gynaecology and urology procedures including nephrectomy, reconstructive surgery, nephropexy, prostate staging and malignancies<sup>4</sup>. Due to proceeding technical innovations and an increasing field of application in the operating room, LESS technology offers a promising growth potential in the field of minimally-invasive surgeries.

LESS surgery is a new procedure that suggests many advantages for the patient. Single-site surgery reduces access trauma and leads to nearly scar-free results. Additionally, reduced pain, fewer post-operative complications, faster recovery times and shorter hospitalisation are potential benefits to be further investigated in clinical studies. These advantages are encouraged for example by a clinical case report on a cyst enucleation<sup>5</sup>. Various small clinical studies support further the feasibility and safety of urological LESS procedures such as nephrectomy and pyeloplasty<sup>6,7,8,4</sup>. New literature and clinical results are emerging quickly to support the advantages of this technology.

### Advanced laparoscopic access and optical devices promise better surgical outcomes

The access technique for LESS surgery uses either single-site access ports or a series of 5-mm trocars side-by-side in the same incision. The TriPort and QuadPort (both available since 2009) from Olympus are the best-known access systems for single-port laparoscopic surgery<sup>9</sup>. The TriPort can be deployed in incisions ranging from 12 mm to 25 mm. It has three inlet valves, including one inlet for a 12-mm instrument and two inlets for 5-mm instruments. A separate insufflation port is provided through a valve. The QuadPort (see Fig. 1) is a multi-instrument access port for advanced laparoscopic surgery and requires a small surgical single incision between 25 mm and 65 mm in length. Both instruments, TriPort and QuadPort, allow small single-site incisions and the usage of 3 or 4 instruments in parallel.



Fig. 1: The new QuadPort allows the introduction of 4 instruments through a single access port.

To advance laparoscopic camera systems for multi ports, videolaparoscopes with deflectable tips have been developed by Olympus. The new HD EndoEYE LTF-VH/VP videolaparoscopes provide high-definition imaging for excellent pictures with a very high pixel density. It also provides unique flexibility due to a camera mounted on a bendable tip, allowing for an optimal positioning of the camera and the instruments. A comparative study from Olympus showed that the range of motion for cameras with a stiff tip but fixed or flexible handle section, when inserted into a TriPort set-up, was the highest for EndoEYE LS videolaparoscopes with a bendable handle section<sup>10</sup>. Additionally, dry lab tests showed that the EndoEYE LS camera performed the best regarding manoeuvrability and ease of handling. Also, most of the EndoEYE laparoscopes are autoclavable and reduce thereby costs.

**Novel pre-clinical studies suggest that pre-bent instruments are time saving, easier to handle and more cost effective**

Single-port surgery, in contrast to multiple-port surgery, does not allow triangulation. Olympus has developed a comprehensive product line of innovative HiQ LS hand instruments that overcome ergonomic challenges. Specifically designed for LESS surgery, these hand instruments offer surgeons optimal ergonomics for comfort and flexibility. Pre-bent HiQ LS hand instruments have a double-curved shaft to allow for independent jaw rotation and excellent manoeuvrability (see Fig. 2). The ergonomic grip offers easy handling. When accessing through a single-site port, these pre-bent instruments support optimal movement of the laparoscope and the instruments, both inside and outside of the abdomen. Also, pre-bent instruments are more cost-effective as they can be sterilised and re-used, unlike to one-time use disposable flexible instruments.



Fig. 2: Pre-bent HiQ LS hand instruments for efficient and safe LESS procedures.

Professor Dr. Stolzenburg, University of Leipzig, published promising novel preclinical data suggesting that pre-bent instruments in LESS procedures show improved efficacy<sup>11</sup>. 24 nephrectomies in 12 pigs were performed by an experienced surgeon using pre-bent instruments and compared to both conventional and flexible instruments. Single ports were used for the flexible and pre-bent instruments. Three ports were used for the conventional instruments. The time requirement for pre-bent instruments showed a significant advantage compared to flexible instruments. Also, participating surgeons state that flexible instruments are difficult to use and show a poor manoeuvrability due to limited rigidity. In summary, this study indicates that pre-bent instruments are time-saving and easier to handle in comparison to conventional laparoscopic surgical techniques. Additionally, specific medical training of the surgeon and frequent surgical application results in fast progress using novel pre-bent instruments.

### The latest clinical LESS studies suggest feasibility, improved cosmesis and a potential decrease in pain

Recently, two large clinical urology studies have been reported. Professor Dr. Desai described in 2009 a clinical study analysing 100 urological LESS procedures with a varying combination of standard and specialised bent or flexible laparoscopic instruments<sup>11</sup>. The investigators confirmed technical feasibility and encouraged further instrumental improvement for increased LESS performance. The analyses of a second prospective clinical study, also comprising 100 urological LESS procedures, suggests feasibility, improved cosmesis and a potential decrease in pain<sup>12</sup>. However, no side-by-side comparison of LESS and standard laparoscopic surgeries has been published to date. As such, further prospective, randomised clinical studies using pre-bent instruments for urological LESS procedures are awaited to support further benefits.

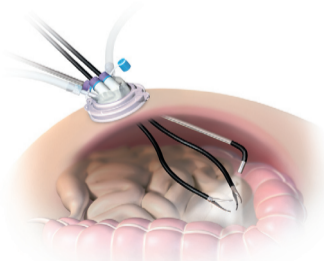


Fig. 3: LESS surgery access devices allow single-site surgical incisions.

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## Interview with Professor Jens-Uwe Stolzenburg, MD, FRCS

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- Laparo-Endoscopic Single-Site (LESS) surgical technology has made significant improvements during the last few years. Faster and less invasive surgery is suggested to result in shorter recovery times, shorter hospitalisation and fewer post-surgical complications. Which important advantages do you see in LESS surgery?  
*We still have to clinically proof these benefits of using the LESS approach compared to conventional laparoscopic surgery. Today we feel that LESS surgery is less traumatic for the patient and it is of course a minimally-invasive surgery with all the advantages compared to open surgery. There is a need for randomised trials comparing LESS surgery to conventional laparoscopic surgery.*
- One of the discussed challenges with more complex laparoscopic operations is longer learning curves for less-experienced doctors and potentially longer operating times. How do you train the medical personnel in your urology department in order to master LESS surgical techniques?  
*Personally I think that the learning curve of LESS surgery is not as steep as it is from open surgery to laparoscopy. For an experienced laparoscopist it is relatively easy to start with the LESS technique because the steps of any LESS procedure are the same as with conventional laparoscopy but using different instruments. I agree that, the surgeon has to train with these new instruments before he begins to operate on real cases. Our department offers LESS training courses lasting three days, including a two-day training on animal models.*
- How often and for which procedures do you perform the LESS technique in comparison to open surgeries in cases where you have the choice?  
*In principle, all candidates for laparoscopic procedures are also candidates for LESS surgery. But we are at the beginning of a new area of surgery and the development of the LESS equipment is still ongoing. As for any new surgical technique, we do select the patients.*
- What is in your opinion the major advantage of pre-bent instruments compared to stiff, conventional or flexible instruments? In a comparative study you assessed LESS instruments compared to conventional instruments (stiff and flexible) in a dry laboratory and in a porcine model. You showed some advantages of the pre-bent LESS surgical instruments. Do you want to comment on that?  
*Pre-bent instruments have a significant advantage over flexible instruments in terms of time requirement to accomplish surgical tasks and manoeuvrability. Flexible instruments require more time than the conventional laparoscopic instruments in order to perform the tasks. There were no significant differences in the time required for the accomplishment of dry laboratory tasks or steps of nephrectomy using conventional instruments through three ports in comparison to pre-bent instruments through a single port.*
- Which clinical and technical advantages do you see for the QuadPort in comparison to the TriPort? Does the QuadPort allow for comparable manoeuvrability and reduced instrument clashing (both inside and outside of the abdomen)?  
*For complex surgery including gastrointestinal anastomosis (GIA), the removal of endobags and other procedures, the QuadPort is far superior, giving you more flexibility to introduce conventional instruments. Additionally, the clashing is reduced due to the structure of the port with one 15-mm, two 10-mm and one 5-mm access holes. I use the TriPort only for minor cases like renal cyst marsupialisation or bladder diverticulectomy.*
- As a surgeon in urology you are frequently using minimally-invasive endoscopic surgery techniques. Do you see a potential for additional future technical improvement for LESS surgical instruments that are advantageous to you and other doctors?  
*LESS equipment is still in evolution. We will continue to work with industry to improve these instruments continuously. This can also include the development of special kinds of surgical manipulators with mini-motors.*
- Do you currently perform or are you aware of randomised prospective clinical trials to evaluate the efficacy (operative times, analgesic use, blood loss, complication rate) of LESS surgery using pre-bent instruments?  
*Currently, we are starting a randomised controlled trial to compare LESS surgery with conventional laparoscopic tumournephrectomy.*
- Do you see an emerging acceptance/usage from doctors and patients for this new surgical technique?  
*I feel that single-port surgery will be the future. However, we should not forget that if any complication or problem occurs during surgery it is more than acceptable to introduce one or two other trocars during LESS procedures. Furthermore I think that single-port surgery should be combined with needlescopic instruments (2.5-mm or 3-mm), providing optimal cosmetic results for the patients.*

For further information please visit [www.less-surgery.eu](http://www.less-surgery.eu), contact us by email [less-surgery@olympus.eu](mailto:less-surgery@olympus.eu), or visit us at our booth hall 8, level 1, no. G06 at the congress of the European Association of Urology from April 16-20 2010.