Use of the Laparoscope Holder for Liver Retraction during Urological Laparoscopic Surgery

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Key Words
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Abstract
Purpose: During laparoscopy, as in open surgery, exposure is critical. Here, we describe the use of a laparoscope holder to facilitate the liver lift during urological laparoscopic surgery.

Materials and Methods: Laparoscopic right radical nephrectomy (n = 3), partial nephrectomy (n = 1), and adrenalectomy (n = 2) were performed with 4 ports. At the beginning of the operation, the small snake retractor was placed through the 5-mm port under direct vision and the liver was lifted in the appropriate direction to optimize exposure.

Results: The laparoscope holder provided quick, reproducible retraction to facilitate exposure. No complications occurred with its use. The device reduced the need for a dedicated second assistant to stand bedside.

Conclusions: We achieved significant improvements in the safety and efficiency of liver retraction during urological laparoscopic surgery using the laparoscope holder.

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Introduction
During laparoscopic right adrenal and renal surgery, liver retraction is essential to enable full visualization [1]. However, once the liver is retracted and an adequate view is established, the camera lens is focused mainly on the immediate operative field, not the retracted liver. Once the field of view shifts from the retractor, the instrument may drift, compromising exposure. Thus, surgical assistants are regularly entrusted with the use of an unfamiliar instrument to retract an unseen liver for an extended period of time. As the surgical procedures increase in complexity, it is difficult to constantly maintain the proper amount of isometric force and the proper retractor position to maintain optimal exposure. As a result of muscle fatigue in the assistant surgeon, the retractors may accidentally move or excessive force may inadvertently be applied when the liver is retracted. Injury to the liver may occur out of the surgical field of vision during instrument manipulation. In fact, subcapsular hematoma and tear of the liver have been reported during laparoscopic cholecystectomy but have not been reported following open cholecystectomy [2–7]. Postoperative hemorrhage due to a hematoma or tear of the liver is a rare but life-threatening complication. To overcome these problems, we describe the use of the laparoscope holder to help facilitate the liver lift during right adrenal and renal surgery.

Patients and Methods
Beginning in April 2010, 6 cases were included in this study. Laparoscopic right radical nephrectomy (LRRN) (n = 3), laparoscopic right partial nephrectomy (LRPN) (n = 1), and laparoscopic right adrenalectomy (LRA) (n = 2) were performed with 4 ports. The laparoscope holder (Karl Storz GmbH and Co., Tuttingen, Germany) consisted of 4 components: a table holder, a base rod,
an articulating arm, and a precision clamp (fig. 1). The clamp, located at the tip of the holding system, accommodates instruments of various sizes. The articulating arm has 3 joints and is operated manually to aid in positioning. At the beginning of the operation, the device is quickly clamped to the table via the base rod over a sterile drape. Through the 5-mm port, the small 5-mm snake retractor (Snowden-Pencer, McGaw Park, IL; 40 mm in diameter) is placed under direct vision and the liver is lifted in the appropriate direction to optimize exposure. Once in the proper position, the set screw on the handle is tightened, thereby precluding any inadvertent release of the surface of the retractor. The laparoscope holder is also fastened, securing the retractor in the desired position. If required, minor repositioning of the device can easily be performed by the assistant.

Results

We used the laparoscope holder to facilitate retraction of the liver. The livers were adequately retracted using the described method and the right renal pedicle and right adrenal central vein were fully exposed in all cases. The device also eliminated the need for a dedicated second scrubbed assistant to stand bedside, which limited the need to only one assistant to assist with the camera operation. The laparoscope holder provided quick, reproducible retraction to facilitate exposure during surgery. The laparoscope holder maintained the retraction of the liver in the appropriate direction. No complications related to use of the laparoscope holder were observed. The time required to set the device up was less than 5 minutes. Moreover, no internal or external instrument collisions occurred during the surgery. Preoperative aspartate aminotransferase levels were within normal limits (<40 IU/l) except in 1 patient whose level was 82 IU/l because of a fatty liver. The levels had not changed significantly on postoperative day 7 in all 6 patients.

Discussion

Exposure is critical to the efficient and safe completion of all surgical procedures. During laparoscopy, with its limited field of view, this aspect of surgery becomes even more important, since the surgeons forfeit their primary sense of touch for visually based information [8, 9]. In LRRN, LRPN, and LRA, the snake retractor is useful to retract the liver in order to keep the surgical field clear. In conventional laparoscopic liver lift by an assistant, the potential disadvantages of using the snake retractor includes over-retraction of tissues, which may lead to liver tears [10]. Although the assistant should bear this in mind and use the snake retractor with an appropriate amount of force for the liver, it is difficult to constantly maintain the proper amount of isometric force and the proper retractor position to maintain optimal exposure [11].

Our method using the laparoscope holder device for liver retraction from the initial stage of surgery can be recommended for the following reasons. The device eliminates the need for a dedicated second scrubbed ass-
sistant to stand bedside, thus limiting the need to only one assistant. In conventional LRRN, LRPN, and LRA, as the surgical procedures increase in complexity; 2 bed-side assistants are occasionally required. Because the participation of second assistants may impractical, especially in community hospitals and private institutions, the introduction of positioning systems for laparoscopic procedures may be a more suitable option for community urologists with limited personnel resources. Moreover, it leaves one of the first assistant’s hands free and enables concentration on the camera operation instead of maintenance of the surgical field. Without it, the first assistant surgeon has to retract the liver with one hand and operate the camera with the other. Since the main laparoscopic view in most procedures is focused on the surgical site and not the retracted liver, the likelihood of iatrogenic injury to the patient increases. Second, it constantly maintains a better surgical field through the proper retractor position and keeps the proper amount of isometric force for optimal exposure. Excessive force, instrument migration due to muscle fatigue, and liver injury as a result of improper instrument manipulation are all substantially reduced with this device. Furthermore, it provides tension so tissues can be separated by retraction, making it easier to manage the procedure. However, these passive systems are unable to respond to anatomical shifts caused by changes in organ manipulation. If required, minor repositioning of the device can easily be performed by the first assistant. Third, our method using the laparoscope holder device offers a simple, inexpensive tool to reproduce the liver traction. The tool is reusable and its use can eliminate the need for a second surgical assistant. Human assistance is costly and oftentimes it does not provide complete satisfaction to the surgeon. Recently, Shabbir et al. [12] described a liver retraction technique using a suture that simultaneously retracts the falciform ligament and the left lobe of the liver during laparoscopic gastrectomy. However, suturing of the abdominal cavity is not an easy task, especially for novice surgeons, and whether this technique is also applicable to the retraction of the right lobe is unknown. We are confident that because our method is simple and does not require advanced laparoscopic skill, it can easily be performed by many urologists.

**Conclusion**

We have achieved significant improvements in the safety and efficiency of liver retraction during LRRN, LRPN, and LRA using a laparoscope holder. Furthermore, this tool eliminates assistant muscle fatigue and instrument migration, and eliminates the need for a dedicated second terminal assistant. Our preliminary clinical experience revealed that there are no complications related to this procedure and that the applied retraction force did not damage the liver during the procedure. This technique may be helpful not only in urological laparoscopic surgery, but also in gall bladder, esophageal, and gastric surgical approaches.

**References**