Simple and cost-effective liver retraction technique for laparoscopic right adrenalectomy – An initial experience from a tertiary care centre

Saarim Bari, Kushagra Gaurav, Akshay Anand, Abhinav Arun Sonkar

Department of Surgery, King George's Medical University, Lucknow, Uttar Pradesh, India

Abstract

Liver retraction is a critical step for optimal surgical exposure and preventing liver injury during right laparoscopic adrenalectomy (LA), due to the complex relationship of the suprarenal gland with the inferior vena cava and liver. Current retraction methods require specialised instruments like Nathanson and robotic retractors, which are challenging to procure in developing countries due to limited funding and resources. To overcome these challenges, we propose a technique for liver retraction using locally available basic laparoscopic tools, making LA more feasible in resource-limited settings. The patient was laid in the reverse Trendelenburg position and then laterally rotated to the left. Port 1, port 2 and port 3 were placed in a triangular configuration with the camera lying *in situ* in port 2, while ports 1 and 3 serve as working ports. Port 4 was made in the epigastrium, and a Maryland forceps or laparoscopic needle holder was introduced beneath the right liver lobe, supporting the liver uniformly. This surgical technique is characterised by its simplicity, feasibility and cost-effectiveness. It ensures reliable liver retraction while providing ergonomic benefits for surgeons and upholding both surgical safety and operational efficiency.

Keywords: Adrenal tumours, laparoscopic adrenalectomy, minimally invasive adrenalectomy, minimally invasive surgery

Address for correspondence: Dr. Kushagra Gaurav, Department of Surgery, King George's Medical University, Chowk, Lucknow - 226 003, Uttar Pradesh, India.
E-mail: kushagra_gaurav@yahoo.co.in

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INTRODUCTION

The liver is positioned anterosuperior to the suprarenal gland, with the inferior vena cava located medially to it, which increases the risk of iatrogenic hepatic injury during right laparoscopic adrenalectomy (LA).[1] Optimal liver function remains a critical determinant for patients' survival; hence, any intraoperative insult to the liver may increase their mortality risk.[2] Therefore, liver retraction remains a quintessential step in right LA, which enhances visualisation and surgical access and widens the adrenal field, thereby reducing the risk of iatrogenic injury.

Over time, surgeons have explored various liver retraction methods, including manual and laparoscopic techniques that often rely on an assistant to maintain a constant force on the unseen liver. Non-uniform retractive force stemming from inevitable muscular fatigue and manipulation can

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lead to hepatic injuries leading to lobar atrophy, necrosis and haematomas. Consequently, using either a Nathanson or robotic retractor remains the only alternative option. However, both options are economically unfeasible to acquire in the developing world, where both limited resources and institutional funding remain a pondering issue. To tackle such challenges, we present a liver retraction technique using easily accessible basic laparoscopic equipment that can be utilised in any laparoscopic urological procedure.

MATERIALS AND SURGICAL TECHNIQUE

Position of the patient

The patient was laid supine with the head end elevated to 15°–20° (reverse Trendelenburg position) and laterally rotated towards the left side by 45°–60°. Both manoeuvres allowed the bowel to fall away from the surgical field. A complete 90° rotation was avoided to restrict the right lobe from falling and obscuring the surgical field. The head was supported by a silicone ring, and an endotracheal tube was secured in place. Cotton padding was applied at all pressure points, while the right arm rested on an armrest, and pillows were placed between the legs.

Port placement

Three ports (port 1 and port 3 each measuring 10 mm; port 2 measuring 5 mm) (Ethicon Surgical Technologies, Cincinnati, OH, USA) were placed in a triangular configuration [Figures 1a and 2a] or in a linear configuration [Figure 1b] favouring the ergonomic needs of the surgeon. The middle (port 2) served as a visualisation port, whereas the right 10 mm (port 1) and the left 5 mm (port 2) served as working ports for harmonic and atraumatic grasping forceps, respectively. A 5 mm (port 4) was made in the epigastric region for liver retraction. The positioning and placement of this port were determined after visualising the liver via the telescope to analyse the left lobar size, falciform ligament position and the proximity of the tumour to the liver. The laparoscopic needle holder/Maryland forceps (Stryker Corporation, Kalamazoo, MI, USA) was introduced via port 4 towards the right peritoneum and negotiated beneath the right lobe of the liver, which offered uniform distribution of the weight of the right lobe onto the stem of the instrument. Finally, the right abdominal wall was grasped using the Maryland forceps [Figure 2b].

DISCUSSION

This technique of liver retraction is simple, feasible and cost-effective, making it easily reproducible. It provides optimal exposure to the operative field, which is critical for the safety and efficiency of the procedure. Conventional manual and laparoscopic approaches to liver retraction require a dedicated assistant to hold the retractor. This reliance poses a risk of liver tears due to the application of non-uniform and excessively high retraction forces.[3]

Alternative methods for liver retraction include using the Nathanson retractor, which provides atraumatic exposure by evenly distributing its weight and preventing tissue drift.

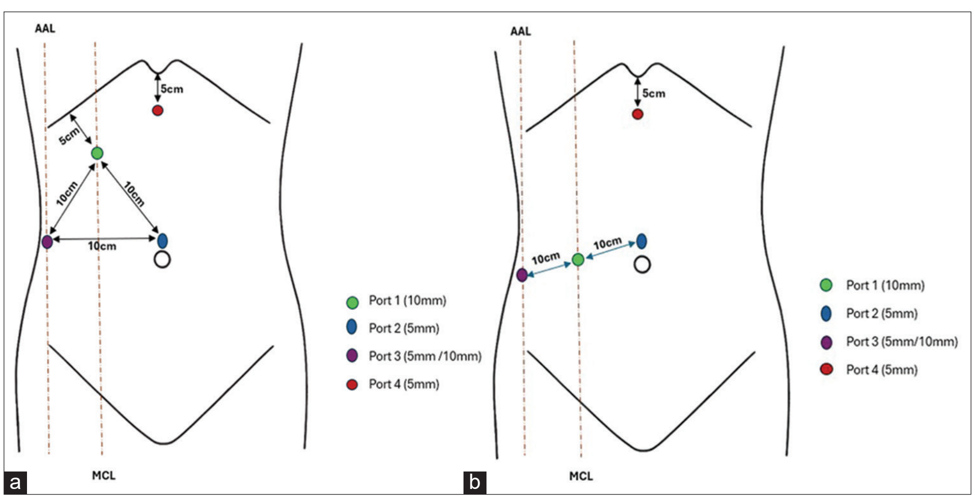

Figure 1: (a) Triangular configuration. Port 1 is placed 5 cm below the right costal margin along the midclavicular line 10 cm apart from port 2 and port 3. Port 2 is placed in the supraumbilical or infraumbilical region 10 cm apart from port 1 and port 3. Port 3 (either 5 mm or 10 mm) is placed along the anterior axillary line 10 cm apart from port 1 and port 2. Ports 1, 2 and 3 are hence placed in an equilateral triangular fashion. Port 4 is placed 5 cm below the xiphisternum in the epigastrium. (b) Linear equidistant configuration. Port 2 is placed either in the supraumbilical or infraumbilical region. Port 1 is made along the midclavicular line 10 cm apart from port 2 followed by the placement of port 3 10 cm apart along the anterior axillary line such that all ports 1, 2 and 3 lie in a linear and equidistant fashion. Port 4 is made 5 cm below the xiphisternum in the epigastrium. AAL: Anterior axillary line, MCL: Midclavicular line

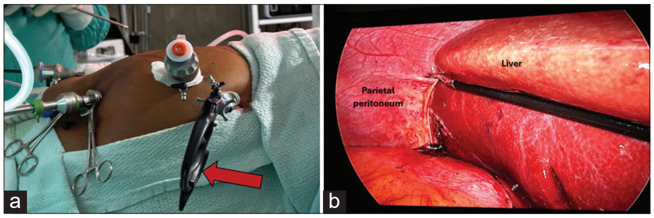

Figure 2: (a) Depicting ports for right laparoscopic adrenalectomy *in situ* in a triangular configuration and the liver is retracted with the authors' technique using the liver retractor port indicated by a red arrow. (b) Intrabdominal view showing a Maryland forceps holding the parietal peritoneum and the liver retracted medially

However, its cost can be a barrier in a resource-constrained developing world. Rarely, it may lead to complications such as lobar atrophy or acute liver failure.[4] On the contrary, robotic liver retraction serves as an effective alternative, providing precise and controlled retraction. However, the procurement of robotic systems is often impeded by the significant costs associated with their maintenance and installation. Furthermore, there exists a considerable learning curve when employing robotic systems in surgical procedures.

Contrastingly, the technique proposed herein substantially mitigates the risk of complications through the locking mechanism of the needle holder enabling static retraction, which prevents both axial rotation and drift of the grasped tissue. Hence, this approach addresses challenges, such as improper instrument handling and inevitable muscular fatigue experienced by assistants, by providing static liver retraction with the uniform force required for optimal exposure.[5] In addition, by eliminating the need for a scrubbed assistant, this technique enables the surgical staff to focus on the retracted liver, reducing the risk of retraction-related injuries, while the lead assistant monitors the surgical site through the telescope, thereby upholding patient safety at the same juncture.

In conclusion, this surgical approach employs standard laparoscopic instruments easily accessible at secondary and tertiary care centres in developing countries. It minimises costs associated with specialised equipment while providing comparable benefits to robotic and Nathanson retractors, all with minimal retraction effort.

Authorship declaration

All authors have made significant contributions to this manuscript and meet the authorship criteria set by the International Committee of Medical Journal Editors. Each author declares that they have read and approved the definitive version of the manuscript.

Ethical statement

Ethical review was not required by King George's Medical University Ethics Review Board, as the author's technique is a modification of an established surgical procedure routinely practiced at the institution, and the patient information has been anonymised.

Patient consent statement

Informed written consent was obtained from the patient.

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Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Nayak SB, Surendran S, Nelluri VM, Kumar N, Aithal AP. A South Indian cadaveric study about the relationship of hepatic segment of inferior vena cava with the liver. J Clin Diagn Res 2016;10:C04-7.
2. Gupta PK, Natarajan B, Pallati PK, Gupta H, Sainath J, Fitzgibbons RJ Jr. Outcomes after laparoscopic adrenalectomy. Surg Endosc 2011;25:784-94.
3. Desgrandchamps F, Gossot D, Jabbour ME, Meria P, Teillac P, Le Duc A. A 3 trocar technique for transperitoneal laparoscopic nephrectomy. J Urol 1999;161:1530-2.
4. Tamhankar AP, Kelty CJ, Jacob G. Retraction-related liver lobe necrosis after laparoscopic gastric surgery. JSLS 2011;15:117-21.
5. Yoon GH, Dunn MD. Case report: Subcapsular hepatic hematoma: Retraction injury during laparoscopic adrenalectomy. J Endourol 2006;20:127-9.