Laparoscopic sleeve gastrectomy using the LiVac liver retractor system: technical report

Daegeun Park¹, Yong Jin Kim², Yoona Chung²

¹Department of Surgery, Kyung Hee University Medical Center, Seoul, Korea
²Bariatric and Metabolic Surgery Center, Department of Surgery, H+ Yangji Hospital, Seoul, Korea

INTRODUCTION

The clear visualization of the angle of His (AOH) is the most fundamental process in performing any bariatric surgery. Even in laparoscopic sleeve gastrectomy (LSG), accessing the AOH through stable liver retraction is a crucial step for these purposes: (1) complete freeing of the gastric posterior wall, (2) full exposure of the esophageal hiatus, and (3) avoiding infringement of the esophagus during firing of the final linear stapler [1,2]. A new internal liver retractor, the LiVac (LiVac, Pty Ltd.) has recently been introduced. This study was conducted to evaluate the feasibility of the LiVac in LSG. We applied the LiVac in 20 patients who received LSG. The feasibility was assessed by exposure of the AOH, operation time, complications, and changes of aspartate transaminase and alanine transaminase. In all 20 patients, exposure of the AOH was successful. The mean operation time was 88 minutes. The changes in preoperative and postoperative aspartate transaminase and alanine transaminase levels were 18.6 and 9.1 U/L, respectively. There were no related morbidities. In LSG, exposure of the AOH using the LiVac was technically feasible.

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Key Words: Bariatric surgery, LiVac, Liver retractor, Sleeve gastrectomy

METHODS

Patients

The study population was comprised of 20 consecutive patients who were scheduled for primary sleeve gastrectomy. These patients were suitable candidates for bariatric surgery according to the criteria of the Korean metabolic and bariatric surgery guidelines, approved by the Ministry of Health & Welfare, Republic of Korea [5,6]. The mean age of the patients was 29 years (range, 18–41 years) and 17 patients were female. The mean body weight was 105.4 kg (range, 83–131 kg) and the mean body mass index was 38.2 kg/m² (range, 32–51 kg/m²). There were 10 patients who had nonalcoholic fatty liver disease (NAFLD). This study was approved by the Institutional Review Board of H+ Yangji Hospital in Seoul, Korea (No. M2020-002). Informed consent was obtained from all individual participants included in the study. All procedures performed in studies...
involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

LiVac system

The LiVac retractor, CE (Conformite Europeenne) marked and Korean Ministry of Food and Drug Safety approved, is a novel medical device that was clinically first used in 2013. It is comprised of a soft silicone ring connected to suction tubing (A), tube connector (B), and trocar carrier (C) (Fig. 1) [3]. The LiVac retractor is placed between the liver and abdominal wall. The suction tubing connects to an external suction hose via the tube connector which is placed at trocar site. Then, negative pressure between 450 to 550 mmHg is applied to the tubing, which then opposes the liver and diaphragm with vacuum forces. The LiVac does not require an additional incision for application.

Surgical techniques

Four trocars were used to perform the LSG: one 15-mm trocar, one 12-mm trocar, two 5-mm trocars. The first trocar was placed in the left upper quadrant using the optical access method with a 0° 5-mm scope and was used to achieve pneumoperitoneum. The suction tubing of the LiVac device was inserted into the peritoneal cavity via the 15-mm trocar. Afterward, the tube connector for negative pressure was located beside the 12-mm trocar at the lower portion of the left upper quadrant (Fig. 2).

The suction tubing was located on the surface of the left hepatic lobe. Negative pressure via the LiVac device was applied with temporary discontinuation of gas insufflation into the peritoneal cavity. We used a 56-mm sized LiVac device. The negative pressure of 450 mmHg was applied.

LSG was performed in the usual manner under the guidance of a 36-French bougie. Reinforcement sutures were done using 3-0 V-lock (Covidien, Dublin, Ireland) in a continuous seroseral manner. We pulled out the resected stomach through the 15-mm trocar site, the LiVac device was removed through the 12-mm trocar site of the left abdomen. The fascia was closed at the 15-mm trocar site using EZ-Close (Medical Impact, Seoul, Korea) (Supplementary Video 1).
RESULTS

From August to September 2020, a total of 20 LSG underwent liver retraction using this technique. In all cases, full exposure of the AOH was achieved by 56-mm sized LiVac and pneumoperitoneum was maintained at 12 to 14 mmHg (Fig. 3). The mean operation time was 88 minutes (range, 55–160 minutes). The operation time was 160 minutes in one patient who had received concomitant cholecystectomy. The operation time in the other 19 patients was less than 100 minutes.

The LiVac device did leave a suction mark on the surface of the liver that faded to a lighter color over the remaining operation time. There were no other traumatic injuries such as serosal tears or lacerations (Fig. 4). The preoperative and postoperative serum liver enzyme levels were collected. The change in AST and ALT was 18.6 U/L and 9.1 U/L, consecutively. When comparing the liver enzyme levels on postoperative day 1 to that of the preoperative levels, AST was 1.2 U/L and ALT was –0.8 U/L. Among the 20 patients, there were 10 patients with NAFLD. The change between preoperative and postoperative levels of AST and ALT in patients with NAFLD were 20.1 U/L and 7.8 U/L, respectively. On postoperative day 1, the change in AST level was –1.9 U/L and the change in ALT level was –4.7 U/L. In patients without fatty liver, the change between preoperative and postoperative AST and ALT levels was 17.1 U/L and 10.4 U/L. On postoperative day 1, the change in AST and ALT levels were 4.2 U/L and 3.1 U/L.

There were no other related morbidities. The average postoperative hospital stay was 2 days (range, 2–4 days).

In conclusion, the new internal liver retractor device, the LiVac, is feasible for morbidly obese patients. Further investigation comparing LiVac with other conventional liver retraction methods is needed.

SUPPLEMENTARY MATERIALS

Supplementary Video 1 can be found via https://doi.org/10.4174/astr.2021.101.1.65.

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Conflict of Interest
No potential conflict of interest relevant to this article was reported.

ORCID iD
Daegeun Park: https://orcid.org/0000-0002-9808-6150
Yong Jin Kim: https://orcid.org/0000-0003-1222-2121
Yoona Chung: https://orcid.org/0000-0002-2812-8714

Author Contribution
Conceptualization: DGP, YJK
Formal Analysis: DGP
Investigation, Methodology: YC
Project Administration: YJK
Writing – Original Draft: DGP
Writing – Review & Editing: All authors

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