



# Bikini Line Approach for Cosmetic Laparoscopic Cholecystectomy

Mostafa Ibrahim<sup>1</sup> · Moamen Shalkamy Abdelgawaad<sup>1</sup> · Ragai Sobhi Hanna<sup>1</sup>

Received: 16 February 2022 / Accepted: 18 July 2022 / Published online: 26 July 2022  
© The Author(s) 2022

## Abstract

Four-port laparoscopic cholecystectomy (LC) is a standard procedure. Several alternative approaches have been described to make trocar scars invisible. This study describes and was successfully administered as a pilot for feasibility and safety of a bikini line port for better aesthetic results. In patients with symptomatic cholelithiasis undergoing LC between June 2021 and December 2021, bikini line ports were used in 67 patients. With the patient in the supine position, the first trocar (11 mm) was inserted into the abdomen through the umbilicus. The other three trocars were placed in the lower abdomen at the bikini line with the help of the camera. Standard instruments were used to perform the surgery. The mean operative time was 54.66 SD 14.1 min. No intraoperative or postoperative adverse events took place. The median follow-up for this cohort was 24 weeks. Cosmetic results were satisfactory for all patients. The use of one umbilical camera port and the other three ports in the bikini line in the lower abdomen completely hides the scars from the ports' incision. The technique was quickly adopted by regular laparoscopic surgeons with usual instruments, much to the satisfaction of patients.

**Keywords** Laparoscopy · Cholecystectomy · Bikini line · Cosmetic cholecystectomy

## Introduction

The laparoscopic approach is the standard procedure for the removal of the gall bladder when cholecystectomy is indicated. The conventional 4-port laparoscopic cholecystectomy is one of the most performed surgeries worldwide [1]. However, surgeons have lately advised numerous alternative techniques such as single incision laparoscopic cholecystectomy (SILC) and natural orifice transluminal endoscopic surgery (NOTES), to minimize or eliminate scars, improve aesthetics, and achieve patient's satisfaction [2, 3]. Technical constraints and the need for special instruments limit both techniques [4]. SILC has also been linked to an increased risk of wound infection and incisional hernia [5]. Surgeons have been interested in doing LC using the modified bikini line approach because of the benefit of hidden or minimal scars, lower costs associated, and maintaining the same laparoscopic principles as traditional [6]. The goal of this study was to show that the modified bikini line approach

was feasible and safe and that it could be used to achieve satisfactory cosmetic outcomes.

## Patients and Methods

This is a prospective observational study including 67 patients with symptomatic gall stone who underwent LC between June 2021 and January 2022 at Assuit University Hospital. The modified bikini line approach was used. Exclusion criteria were incision scars in the upper abdomen due to previous surgery, body mass index (BMI)  $\geq 40$ , and age  $> 65$  years. All of the patients gave their informed consent. All of the surgeries were carried out by the same surgical team and in accordance with the rules of the local authority and ethical committee.

## Operative Technique

The patients were positioned in the reversed Trendelenburg position, with their head up and their adducted legs down. For more convenient ergonomics, the surgeon and the first assistant stayed on the right side of the patient. The scrub nurse remained on the left side, but the laparoscopy tower

✉ Mostafa Ibrahim  
Mostafamahmoud562@aun.edu.eg

<sup>1</sup> Department of Surgery, Assuit University Hospital, Assuit University, Assuit, Egypt

was placed on the upper right. The visiport was used to create the pneumoperitoneum. The abdomen is insufflated to a pressure of 13–15 mm Hg. First, an 11-mm port for the 30-degree telescope is introduced. The peritoneal cavity was inspected for the possibility of the modified bikini approach. At the bikini line, one 11-mm trocar was placed at the midline, and two 5-mm trocars were placed on the right side. At this time, the camera was relocated from the umbilical to the 11-mm midline suprapubic port. Eventually, we had 4 ports (one umbilical and three ports along the bikini line). For traction of the gallbladder fundus, the assistant used the lateral right suprapubic port, while the operator surgeon used both the umbilical port and the medial 5-mm port as working ports. Depending on the intraoperative condition, all ports could be exchanged. The quality of the image of the midline port was the same as that obtained during conventional laparoscopic cholecystectomy; therefore, there was no risk of adverse events. Throughout the operation, we used the standard LC instruments. The umbilical trocar was used for dissection and clipping of the cystic artery and duct, while the medial suprapubic port was used to grab the Hartman's pouch. Using a hook connected to a diathermy device, the gallbladder was sharply detached from its bed. The gallbladder (GB) was removed from the umbilical trocar under vision. There was no need to dilate the 11-mm incision. In certain cases, we used suction to aspirate excess bile to reduce the volume of the GB and therefore facilitate its extraction. If there are any trapped stones at the bottom of the GB, we use stone forceps to dislodge them through a small hole in the neck. Through the lateral 5-mm trocar, a drain was inserted (Fig. 1).



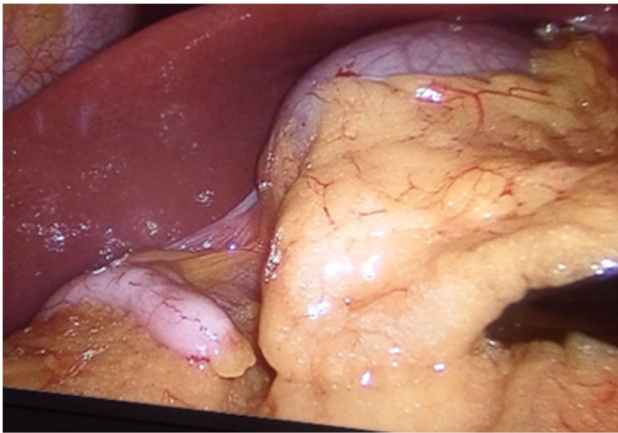
**Fig. 1** A drain via lateral 5-mm port

## Results

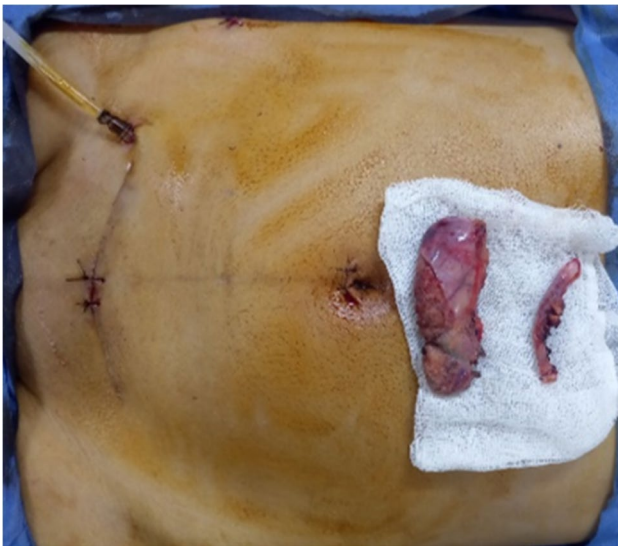
A total of 67 (54 women; 13 men) between June 2021 and December 2021 were included in the study. All of the procedures were completed laparoscopically, with a 0% conversion rate. The mean age was  $39.98 \pm 12.102$ , with a range of 20 to 61. The mean BMI was  $(27.871 \pm 6.043)$ , with a range of 19 to 39 kg/m<sup>2</sup>. Operative time ranged from 35 to 95 min, with a mean of  $54.641 \pm 14.111$  min. There were 46 ladies previously had a cesarean section (Fig. 2). Indications for cholecystectomy were chronic cholecystitis in 61 patients; acute cholecystitis in four patients; gangrenous cholecystitis in one patient; and concomitant chronic appendicitis and chronic cholecystitis in one patient (Figs. 3 and 4). Except for two patients, all drains were removed, and the patients were discharged within 24 h after surgery. The first patient had a gangrenous gallbladder and was discharged on the second postoperative day. The second one had concomitant appendectomy and cholecystectomy. This patient was discharged on the third postoperative day. There were no intraoperative complications or unexpected events. No additional ports were used. During the 30-day visits, no postoperative complications were discovered. The median follow-up period was 24 weeks. During follow-up visits, all patients reported satisfactory cosmetic results.



**Fig. 2** A lady with previous CS



**Fig. 3** Intraoperative image (subhepatic appendix)



**Fig. 4** Concomitant cholecystectomy and appendectomy

## Discussion

The operation of choice for cholecystectomy candidate patients is the conventional LC, which has great results [7]. There have been numerous attempts to minimize or eliminate scars. Change the entry access, reduce port sizes and/or numbers, or modify trocar site insertion to be in a hidden area, according to investigators. NOTES, SILC, and mini laparoscopic cholecystectomy have all developed as a result of this. However, unique equipment such as port systems in SILC, long instruments, specialized optics, and flexible endoscopy in NOTES were required for these techniques. When compared to standard LC, this adds a cost [1, 8].

Ersoz et al. described a full bikini line cholecystectomy with four trocars inserted along the suprapubic line [9].

However, the approach is made more difficult by the lack of angulation and ergonomics when all the four ports are on the same line. Furthermore, this technique is not recommended for people with a high BMI or acute cholecystitis. A modified bikini line approach was developed with the help of an umbilical port and the other three ports on the hairline. This change enables safe access to the abdominal cavity, as well as the selection and insertion of the other trocars while under vision. Another advantage is that the distance and the angulation between instruments are kept. As a result, even in challenging circumstances and patients with a high BMI, greater control of the surgical field is possible. Although we followed the same technique described by Bachmann and others [8, 10–13], the trocar size, the port locations, and the surgeon position were all different.

The modified bikini line approach was found to be a safe procedure in our research. Despite the presence of acute cholecystitis, gangrenous cholecystitis, and concurrent appendectomy with cholecystectomy, no conversion to open surgery was performed in all cases. Throughout the study period, no intraoperative or postoperative diverse events were recorded. There was no need for any additional ports or long instruments. These findings are consistent with earlier research [8, 10, 13, 14]. Other investigations [6, 12, 15–17], on the other hand, conversion to open surgery, intraoperative complications, an extra port insertion in the upper abdomen, and long instruments were reported. The two 11-mm ports might be changed for 5-mm ports to improve the aesthetic effects. The lack of a 5-mm camera and other necessary equipment, however, limited the scope of our study to what was available in our department. This modification might be done in further series in the future.

Certainly, the operative time was longer in the first cases, and inconvenient situations (ranging from 35 to 95 min), but it was shorter by time. It is, however, comparable to previous studies [12, 15, 16]. The modified bikini line approach left invisible scars, resulting in good cosmetic outcomes in both genders [10, 13, 15, 18]. All patients in our study, particularly women who already had a Pfannenstiel incision for cesarean section, reported a satisfactory cosmetic outcome. As described by Leggett et al. [19], using small diameter instruments in mini laparoscopy (3 or even 2 mm) is likely to be difficult during extraction of the gall bladder due to the risk of stone leakage; otherwise, we must extend the umbilical incision.

Patients with a BMI  $\geq 40$  were excluded from our study. When used on patients with a higher BMI, where exposure is likely to be challenging, this technique may have some limitations. Furthermore, difficult cholecystectomy, perforated GB, and very tall patients are not good candidates for such technique.

## Conclusion

In conclusion, in selected patients, the technique described in this study is a feasible and safe procedure. It yielded a satisfactory cosmetic result. It can be performed using standard instruments. More research is needed before the procedure is recommended as an alternative to conventional LC.

**Funding** Open access funding provided by The Science, Technology & Innovation Funding Authority (STDF) in cooperation with The Egyptian Knowledge Bank (EKB).

## Declarations

**Ethics Approval** This research was conducted following local ethical committee rules.

**Human and Animal Rights and Informed Consent** This study was performed according to the ethical committee at Assuit University.

**Informed Consent** Informed written consents were obtained from all included patients.

**Conflict of Interest** The authors declare no competing interests.

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Comitalo JB (2012) Laparoscopic cholecystectomy and newer techniques of gallbladder removal. <https://doi.org/10.4293/108680812X13427982377184>
- Zorron R et al (2008) NOTES transvaginal cholecystectomy: preliminary clinical application. *Surg Endosc* 22:542–547. <https://doi.org/10.1007/s00464-007-9646-5>
- A. Schlager et al (2010) Providing more through less: current methods of retraction in SIMIS and NOTES cholecystectomy. <https://doi.org/10.1007/s00464-009-0807-6>
- Luna RA et al (2013) A prospective, randomized comparison of pain, inflammatory response, and short-term outcomes between single port and laparoscopic cholecystectomy and Other Interventional Techniques. *Surg Endosc* 27:1254–1259. <https://doi.org/10.1007/s00464-012-2589-5>
- Hall TC, Dennison AR, Bilku DK, Metcalfe MS, Garcea G (2012) Single-incision laparoscopic cholecystectomy: a systematic review. *Arch Surg* 147(7):657–666
- Silva MVAC, de Almeida DF, Alves MM, de Barbosa MAGA, Vieira MWC (2013) Laparoscopic cholecystectomy with suprapubic approach. *Arq Bras Cir Dig* 26(3):179–183. <https://doi.org/10.1590/S0102-67202013000300005>
- Bignell M et al (2011) Assessment of cosmetic outcome after laparoscopic cholecystectomy among women 4 years after laparoscopic cholecystectomy: Is there a problem? *Surg Endosc* 25(8):2574–2577. <https://doi.org/10.1007/s00464-011-1589-1>
- Sales LAS, Pinto JOG, Queiroz CEF, Castro M, Dourado PHF, Pinheiro FAS (2014) Suprapubic laparoscopic cholecystectomy: technique and preliminary results. *Arq Bras Cir Dig* 27(1):22–25. <https://doi.org/10.1590/S0102-67202014000100006>
- Ersoz F, Ozcan O, Sari S, Bektas H, Arikan S (2011) Laparoscopic cholecystectomy on the bikini line for invisible scar. *Surg Laparosc Endosc Percutan Tech* 21(1):7–10. <https://doi.org/10.1097/SLE.0b013e3182064d5f>
- Bachmann K, Izbicki JR, Strate T (2009) Suprasymphysäre laparo-skopische Cholezystektomie ohne sichtbare Narben: Eine Alternative zu NOTES? *Chirurg* 80(11):1066–1068. <https://doi.org/10.1007/s00104-008-1644-1>
- Gulaydin N (2021) Laparoscopic cholecystectomy by the modified bikini line approach as a simple and safe technique. *Rev Assoc Med Bras* 67(8):1172–1176. <https://doi.org/10.1590/1806-9282.20210589>
- Verma GR (2019) Bikini laparoscopic cholecystectomy: a replica of notes cholecystectomy. *HPB* 21:S185. <https://doi.org/10.1016/j.hpb.2019.03.343>
- Zhang L, Sah B, Ma J, Shang C, Huang Z, Chen Y (2014) A prospective, randomized, controlled, trial comparing occult-scar incision laparoscopic cholecystectomy and classic three-port laparoscopic cholecystectomy. *Surg Endosc* 28(4):1131–1135. <https://doi.org/10.1007/s00464-013-3289-5>
- de la Cruz-Munoz N, Koniaris L (2010) Alternative port site selection (APSS) for improved cosmesis in laparoscopic surgery. *J Gastrointest Surg* 14(12):2004–2008. <https://doi.org/10.1007/s11605-010-1282-z>
- Le Roy B et al (2016) Feasibility prospective study of laparoscopic cholecystectomy with suprapubic approach. *J Visc Surg* 153(5):327–331. <https://doi.org/10.1016/j.jvisc.2016.03.005>
- Federmann GF, Hessler C (2011) Hidden laparoscopic access (HiLA) cholecystectomy-first results. *Eur Surg - Acta Chir Austriaca* 43(1):34–38. <https://doi.org/10.1007/s10353-010-0575-5>
- Akdoglu M, Bostanci EB, Colakoglu MK, Aksoy E (2017) Three-port, two located on the pfannenstiel line, laparoscopic cholecystectomy comparison with traditional laparoscopic cholecystectomy. *Am Surg* 83(3):260–264. <https://doi.org/10.1177/000313481708300321>
- Čala Z, Nikšić K, Neseček Adam V, Klapan D, Soldo I (2006) Cosmetic laparoscopic cholecystectomy. *J Laparoendosc Adv Surg Tech* 16(6):577–581. <https://doi.org/10.1089/lap.2006.16.577>
- Leggett PL, Bissell CD, Churchman-Winn R (2001) Cosmetic minilaparoscopic cholecystectomy. *Surg Endosc* 15(10):1229–1231. <https://doi.org/10.1007/s004640041018>

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.