



# Two Port and Two Suture Modified Laparoscopic Cholecystectomy Technique

## İki Port ve İki Sütür Yardımlı Modifiye Laparoskopik Kolesistektomi Tekniği

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### ABSTRACT

**Aim:** Laparoscopic cholecystectomy is the gold standard method for the treatment of gallstone disease. In this study, the two-port laparoscopic cholecystectomy technique was described.

**Materials and Methods:** The inclusion criteria were having current or past biliary colic, risk of developing gallbladder cancer, porcelain gallbladder, gallbladder polyp larger than 5 mm, and asymptomatic large gallbladder stones (>20 mm). The exclusion criteria were determined as having a suspicious malignancy, an American Society of Anesthesiologists score of 4 or 5, diagnosis of choledocholithiasis, a history of endoscopic retrograde cholangiopancreatography, past intra-abdominal surgery, and a body mass index >33 kg/m<sup>2</sup>.

**Results:** Two-port laparoscopic cholecystectomy was performed in 48 patients. Eleven patients (22.9%) were operated on with a preliminary diagnosis of cholecystitis and 37 patients (77.1%) with a prediagnosis of cholelithiasis. While 39 (81.2%) patients had multiple stones in the gallbladder, 9 (18.8%) had a single stone. The mean gallbladder wall thickness was 4.3±1.7 mm (range 2-10 mm), and the mean stone diameter was 14.0±10.2 mm (range 2-40 mm). The mean operation time in the whole group was 63.4 (range 42-86) minutes. Complications developed in 3 (6%) patients, including 3 subcutaneous infections.

**Conclusion:** For standard four-port cholecystectomy, the two-port and two-suture assisted technique is a good alternative for selected cases. It can be applied successfully and is cosmetically effective.

**Keywords:** Two port laparoscopic cholecystectomy, minimally invasive surgery, methods, equipment, benign gallbladder disease

### ÖZ

**Amaç:** Laparoskopik kolesistektomi safra kesesi taşı hastalığının altın standart tedavi yöntemidir. Bu çalışmada, iki portlu laparoskopik kolesistektomi tekniği anlatıldı.

**Gereç ve Yöntem:** Dahil etme kriterleri, tanı anında veya geçmişte biliyer kolik olması, safra kesesi kanseri geliştirme riskinin bulunması, porselen safra kesesi varlığı, 5 mm'den büyük safra kesesi polibinin saptanması ve asemptomatik büyük safra kesesi taşı (>20 mm) varlığı idi. Dışlama kriterleri, şüpheli malignite durumu, Amerikan Anesteziyologlar Derneği skorunun 4 veya 5 olması, koledokolitiazis tanısının bulunması, endoskopik retrograd kolanjiyopankreatografi öyküsü olması, karın içi cerrahi geçirilmesi ve vücut kitle indeksinin >33 kg/m<sup>2</sup> olması olarak belirlendi.

**Bulgular:** Kırk sekiz hastaya iki port laparoskopik kolesistektomi uygulandı. On bir hasta (%22,9) kolesistit ön tanısı ile, 37 hasta (%77,1) kolelitiazis ön tanısı ile ameliyat edildi. 39 (%81,2) hastada safra kesesinde çok sayıda taş bulunurken, 9 (%18,8) hastada tek taş vardı. Ortalama safra kesesi duvar kalınlığı 4,3±1,7 mm (dağılım 2-10 mm), ortalama taş çapı 14,0±10,2 mm (dağılım 2-40 mm) idi. Tüm grupta ortalama operasyon süresi 63,4 (dağılım 42-86) dakika idi. Üç (%6) hastada komplikasyon olarak deri altı enfeksiyonu gelişti.

**Sonuç:** Standart dört portlu kolesistektomi için, iki portlu ve iki sütür destekli teknik seçilmiş olgular için iyi bir alternatiftir. Başarıyla uygulanabilir ve kozmetik olarak etkilidir.

**Anahtar Kelimeler:** İki port laparoskopik kolesistektomi, minimal invaziv cerrahi, yöntemler, ekipman, benign safra kesesi hastalıkları

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## INTRODUCTION

Cholecystectomy is one of the most common abdominal surgical procedures. Laparoscopic cholecystectomy is the gold standard method for the treatment of gallstone disease. Laparoscopic surgery offers a reduction in postoperative pain, improvement in cosmetic appearance, shortening of hospitalization, and earlier return to work<sup>1,2</sup>.

Many methods have been researched and applied on how to perform laparoscopic cholecystectomy. Of these, mini laparoscopic surgery is beneficial in terms of postoperative pain and cosmetic appearance, but it is costly and 10% is converted to standard laparoscopic cholecystectomy<sup>3,4</sup>. Single incision surgery does not provide significant advantages and increases the risk of incisional hernia fourfold<sup>5-7</sup>. Robotic cholecystectomy does not make any additional contribution in terms of efficacy and safety in benign gallbladder diseases<sup>8,9</sup>. Transluminal endoscopic surgery performed through the natural vaginal opening is a true scar-free surgery method with the potential to minimize postoperative patient discomfort, but it has some technical difficulties<sup>10</sup>. Finally, a two-port and suture assisted laparoscopic cholecystectomy leads to good cosmetic appearance, low cost, and low incidence of postoperative pain<sup>11</sup>.

In our article, we described the two-port laparoscopic cholecystectomy technique that was suitable for minimally invasive surgery.

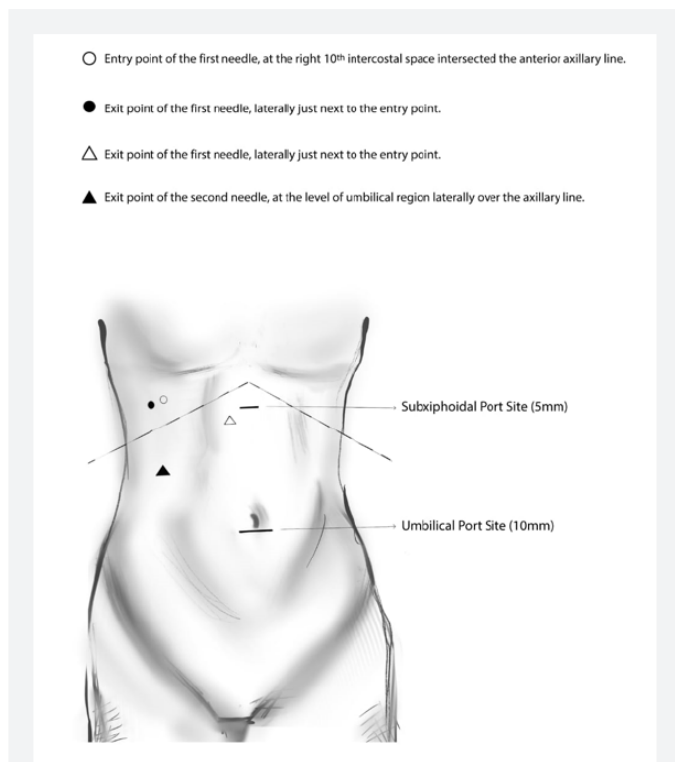
## MATERIALS AND METHODS

This study was carried out at Zeynep Kamil Gynecology and Pediatrics Training and Research Hospital. The study adhered to the principles of the Declaration of Helsinki and we obtained an informed consent from all participants. All patients were informed about the study preoperatively and their written and verbal consents were obtained. The study was approved by the Zeynep Kamil Gynecology and Pediatrics Training and Research Hospital of Ethics Committee (decision no: 40/2021, date: 17.02.2021). The inclusion criteria were having current or past biliary colic, risk of developing gallbladder cancer, porcelain gallbladder, gallbladder polyp larger than 5 mm, and asymptomatic large gallbladder stones (>20 mm). The exclusion criteria were determined as having a suspicious malignancy, an American Society of Anesthesiologists score of 4 or 5, diagnosis of choledocholithiasis, a history of endoscopic retrograde cholangiopancreatography, past intra-abdominal surgery, and a body mass index >33 kg/m<sup>2</sup>. In addition, in laparoscopic exploration, the cases in which gallbladder fundus (due to the obstruction of the tangential and subserosal passage of the straight needle) was not seen, the gallbladder wall thickness was severely increased, the laparoscopic manipulation ability

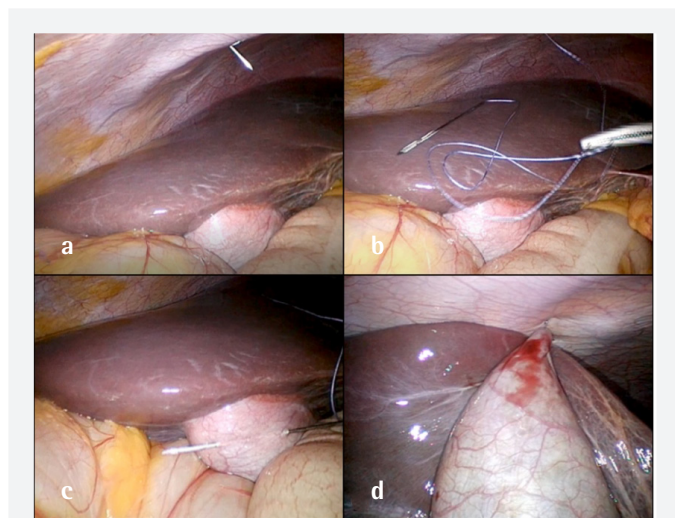
was reduced, the gallbladder had a hydropic appearance, and the patients who had gallbladder with adhesion to the surrounding tissues were not suitable for the technique of two ports and two sutures.

## Operative Technique

All patients were operated under general anesthesia with both arms open and lying in the supine position. The surgical area was cleaned with povidone-iodine. The surgeon and the assistant were on the patient's left side, while the nurse and the monitor were on the right side. After a 1 cm skin incision made from the umbilical region, 10 mm port was placed into the abdomen under open vision by using Hasson technique. The abdomen was explored with a 30 degree 10 mm optic. A 5 mm second port was advanced from the subxiphoidal region under direct view. The gallbladder hilus was observed by lifting the gallbladder towards the cranial region with a clinch. Two straight needle multifilament suture materials were used. The suture material used was Ethicon straight cutting KS 60 mm 75 cm w 9719 3/0 vicryl. The first needle was advanced under direct vision into the abdomen from the point where the right 10<sup>th</sup> intercostal space intersected the anterior axillary line. With the help of the clinch or needle driver, the needle was passed through the fundus of the gallbladder subserosally and tangentially, and was taken out of the abdomen right next to the entry point to the outside. Both arms of the suture were fixed with the help of clamps. Thus, the fundus of the gallbladder was lifted towards the cranial region, fixed, and its hilus became visible (Figure 1, 2). The second needle was advanced into the abdomen just next to the subxiphoidal 5 mm port. The hilus was passed subserosal tangentially, by turning it on itself twice. At the level of the umbilical region, it was protruded laterally out of the abdomen over the axillary line (Figure 1, 3). Both arms of the rope were held with the help of the clamps. Thus, with the help of this clamp during the operation, the surgeon was able to move the hilus of the gallbladder according to the desired point. Dissection was completed with the help of a hook and a dissector, similar to the standard technique (Video 1; doi: 10.6084/m9.figshare.21671186). The 10 mm 30-degree optics was replaced with the 5 mm 30-degree optical. The specimen was taken from the umbilical region to the outside of the abdomen with the help of an endobag, under a 5 mm 30 degree optical sight placed through a 5 mm port. In the umbilical region, the standard fascia closure was done on each patient with 1/0 polydioxanone and 4/0 polyglecapron suture material at the port entrances. No local anesthetic was applied. As a standard procedure, a 10 mm Jackson-Prett drain was placed in all patients who were operated; and a day after the operation, if there was no bile drainage, it was removed.



**Figure 1.** Demonstration of the placement of the ports and the sutures in two port and two suture assisted technique



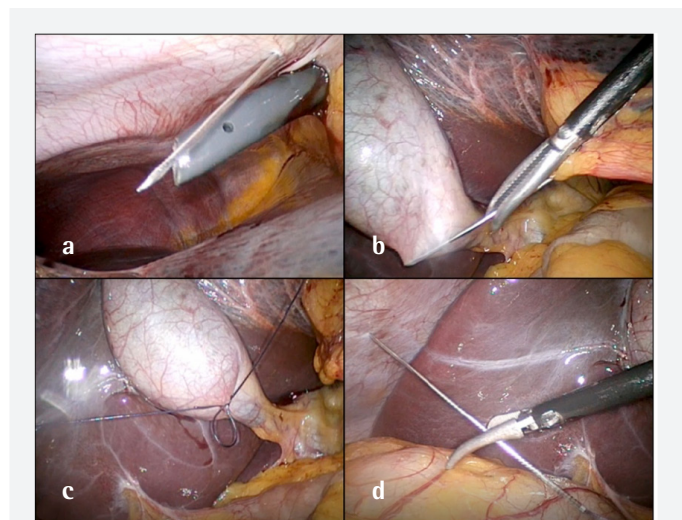
**Figure 2.** The placement of the first straight needle into the abdomen. (a) Advancement of the straight needle under the direct vision into the abdomen from the point where the right 10<sup>th</sup> intercostal space intersected the anterior axillary line. (b) Correction of the needle inside of the abdomen. (c) With the help of clamp, the needle was passed through the fundus of the gallbladder subserosally and tangentially. (d) Eventually the needle was taken out of the abdomen right next to the entry point. After the procedure, the fundus of the gallbladder was lifted and fixed, its hilus became visible

### Statistical Analysis

Mean, standard deviation, median, lowest and highest frequency and ratio values were used in the descriptive statistics of the data. The distribution of variables was measured by the Kolmogorov-Smirnov test. Independent sample t-test and the Mann-Whitney U test were used in the analysis of the quantitative independent data. The chi-square test was used in the analysis of the qualitative independent data, and the Fischer test was used when the chi-square test conditions were not met. Analyses were performed with the Statistical Package for the Social Sciences (SPSS) 27.0 software (IBM SPSS, Inc., Armonk, NY, USA).

### RESULTS

Two-port laparoscopic cholecystectomy was performed in 48 patients. Demographic, biochemical, ultrasonographic, endoscopic, clinical and pathological data of the patients are shown in Table 1. Eleven patients (22.9%) were operated on with a preliminary diagnosis of cholecystitis and 37 patients (77.1%) with a prediagnosis of cholelithiasis. While 39 (81.2%) patients had multiple stones in the gallbladder, 9 (18.8%) had a single stone. The mean gallbladder wall thickness was  $4.3 \pm 1.7$  mm (range 2-10 mm), and the mean stone diameter was  $14.0 \pm 10.2$  mm (range 2-40 mm). There were 36 (75%) patients whose prominent complaint was abdominal pain. This was followed by nausea and bloating in 11 (22.9%) patients and back pain in 1 (2.1%) patient. The mean operation time



**Figure 3.** The placement of the second straight needle into the abdomen. (a) The needle was advanced into the abdomen just next to the subxiphoidal port. (b) The hilus of the gallbladder was passed subserosal and tangentially, by turning it on itself twice. (c) At the level of umbilical region, the needle was taken out of abdomen laterally over the axillary line. (d) Thus, the procedure provides a flexible mobility during the dissection of the hilus of the gallbladder

in the whole group was 63.4 (range 42–86) minutes. The most common postoperative complaint was indigestion and it was observed in 13 (27%) patients. Nine (18.7%) patients had pain at the port sites. The mean time to return to work was  $6.2 \pm 2.3$  (range 4–12) days. The number of patients who stayed in the hospital for one day was 41 (85.4%). Seven (14.5%) patients stayed for two days. Complications developed in 3 (6%) patients, including 3 subcutaneous infections.

## DISCUSSION

Gallstone disease is seen in approximately 9% of women and 6% of men<sup>12</sup>. It does not cause lifelong complaints in most people and is detected incidentally. Whether or not the treatment will be applied is determined according to the patient's complaints, findings obtained from imaging methods, and whether complications develop or not<sup>13</sup>. The standard treatment is performed with four-port laparoscopic

cholecystectomy. Minimally invasive surgical techniques are applied in selected patient groups within the realm of possibility. In this study, a cosmetic appearance was achieved with a two-port and suture-assisted laparoscopic collet system with reduced cost and no special tools.

Various techniques for two-port laparoscopic cholecystectomy have been described in the literature. The technique performed by Ramachandran and Arora<sup>11</sup> with the help of the two ports and three multifilament suture materials is quite similar to the technique we used in our study. Similar to our study, it was reported that the duration of hospitalization was shortened. Hajong and Khariong<sup>14</sup> compared the technique performed with three-port, single-multifilament suture material and the technique with the two-port, two-multifilament suture material. There was no difference between the two groups in terms of operative time. Less pain, better cosmetic appearance, and shorter hospitalization were observed in the two-port group. Lee et al.<sup>15</sup> reported that there was no difference in terms of operating time in the two-port techniques, the length of hospitalization and complication rates were similar, and that more JP drains were used in the four-port group. The studies indicated that better results could be obtained by reducing the number of ports. Robotic cholecystectomy and adrenalectomy with a single incision are performed with increasing frequency and low morbidity rates<sup>16,17</sup>. It is advantageous in terms of cosmetic and postoperative pain, but the cost is high.

Our technique has some differences from the previously described techniques. Two monofilament suture materials with straight needles, one 5 mm and one 10 mm trocars were used. The 10 and 5 mm 30 degree optics were replaced during surgery. When a 5 mm optic cannot be found, a 10 mm subxiphoidal incision can be made and surgery can be performed with only a 10 mm optic. One of the sutures is placed to mobilize the hilus, unlike other techniques. By the help of this suture, the surgeon can perform a safer dissection with his left hand and maintain the safety of the surgery (Figure 3).

The surgical safety of the patient does not deteriorate with the applied technique. It does not create an ergonomic disadvantage for the surgeon. There is no increase in the risk of incisional hernia since the diameter is not increased at the port entry sites. It is an important advantage that it can be applied in every center. As the number of ports is reduced, the cost decreases. In addition, reducing the number of trocars theoretically reduces the rate of hernia. Special equipment and surgical modification are not required. The fact that every surgeon with standard laparoscopic cholecystectomy experience can easily apply the technique in the operating position they are used to may be an important criterion in

**Table 1. The demographic, biochemical, ultrasonographic, endoscopic, clinic, and pathological parameters**

		Mean±SD or n	%
<b>Age</b>		49.0±13.5	
<b>Gender</b>	Female	33	68.8
	Male	15	31.2
<b>Comorbidity</b>	No	16	33.3
	Yes	32	66.7
	Diabetes mellitus	5	15.6
	Cancer	1	3.1
	Essential hypertension	5	15.6
	Hypertriglyceridemia	1	3.1
	Coronary artery disease	2	6.3
	Others	18	56.3
<b>Diagnosis</b>	Cholelithiasis	37	77.1
	Cholecystitis	11	22.9
<b>Largest stone diameter (mm)</b>		14.0±10.2	
<b>Gallbladder wall thickness (mm)</b>		4.3±1.7	
<b>Number of stones</b>	Single	9	18.8
	Multiple	39	81.3
<b>Number of attacks</b>	I	24	50.0
	II	16	33.3
	III≤	8	16.7
<b>Symptom</b>	Stomachache	36	75.0
	Nausea	11	22.9
	Back pain	1	2.1
<b>Pathology result</b>	Chronic cholecystitis	29	60.4
	Cholelithiasis	14	29.2

SD: Standard deviation



their preference. A small number of surgical interventions will be sufficient for learning the technique and then it could be applied easily. If necessary, converting to the standard technique or open surgery is easy during the application of this technique.

### Study Limitations

The study has some limitations, including the absence of a control group or comparison with other surgical techniques. While the duration of the operation was longer at the beginning, the durations began to get shorten as the technique was applied more. Again, while being more selective about patient selection at the beginning, more difficult cases can be operated over time.

### CONCLUSION

In conclusion, here we described a modified two-port and two-suture assisted laparoscopic cholecystectomy. The described technique is not first but it is a cost-effective alternative to the similar techniques in the literature. Our experience has revealed that this new technique can be easily learned and applied. Theoretically, the trocar site hernia rate can be reduced because fewer trocars are used. Nevertheless, efficacy and safety should be investigated with larger randomized controlled trials.

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### Ethics

**Ethics Committee Approval:** The study was approved by the Zeynep Kamil Gynecology and Pediatrics Training and Research Hospital of Ethics Committee (decision no: 40/2021, date: 17.02.2021).

**Informed Consent:** An informed consent was obtained from the patient for this original article.

**Peer-review:** Externally peer-reviewed.

### Authorship Contributions

Surgical and Medical Practices: S.A., Concept: S.A., N.A.S., Design: S.A., Data Collection or Processing: S.A., Analysis or Interpretation: N.A.S., Literature Search: S.A., N.A.S., Writing: S.A.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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