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ADVANCING SURGICAL PRECISION: SUCCESSFUL ROBOTIC-ASSISTED CHOLECYSTECTOMY AND APPENDECTOMY IN JAKARTA, INDONESIA – A CASE REPORT

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Background: Robotic-assisted surgery is becoming increasingly popular in minimally invasive general surgical procedures. Some surgical experts report advantages of robotic-assisted surgery such as higher precision levels, improved visualization, and simulated wrist movements with a wider range of motion. With these advantages, robotic-assisted surgery is considered safe and effective, resulting in outcomes that reduce the risk of conversion to laparoscopy or open surgery. However, cost remains a concern in robotic-assisted surgical procedures. Here, we report the experience of two cases consisting of Cholecystectomy and Appendectomy performed concurrently with gynecological and urological procedures using Robotic-assisted Surgery at a hospital in Jakarta, Indonesia. **Case 1:** A 54-year-old male patient presented with complaints of worsening right upper abdominal pain over the past year and underwent a medical check-up revealing multiple cholelithiasis on abdominal ultrasound examination. The patient was overweight (Body Mass Index (BMI): 29.7 kg/m2) and physical examination revealed tenderness in the Right Upper Quadrant Abdomen (Murphy's sign). Laboratory tests showed dyslipidemia. The patient underwent Robotic-assisted cholecystectomy with minimal bleeding (10 ml), intraoperatively revealing inflamed gallbladder (cholecystitis). Histopathological examination was performed on gallbladder tissue. The patient was observed post-operatively for < 24 hours, recovered well with minimal postoperative pain, good bowel activity, adequate intake, and was able to mobilize well. **Case 2:** A 44-year-old female patient presented with recurrent symptoms of prolonged menstruation and lower abdominal pain. An MRI examination revealed several findings, including intramural submucosal uterine fibroids, right hydronephrosis, and right hydroureter resulting from pressure exerted by a cystic mass in the right adnexa. Additionally, signs of adhesive bowel were noted. During the operation, adhesions and an inflamed appendix were discovered, leading to robotic-assisted appendectomy. The patient was discharged after 24 hours of post-operative observation with good recovery during the follow-up at the outpatient clinic, reporting no pain and uncomplicated wound healing after two weeks of monitoring. **Conclusion:** The cases we report represent the innovative use of robotic technology for cholecystectomy and appendectomy procedures. Robotic-assisted surgery has shown improved safety and higher efficacy compared to conventional laparoscopic surgery.

Keywords: robotic-assisted surgery, cholecystectomy, appendectomy

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INTRODUCTION

Robotic-assisted surgery is increasingly popular for general minimally invasive surgical procedures.[1] Minimally invasive surgical techniques including laparoscopic methods and robotic-assisted surgery, offer several benefits for patients such as reduced pain, faster recovery, less bleeding, and lower risk of morbidity and mortality compared to open surgery (laparotomy).[5,6] Many surgeons recognize that improved visualization, better ergonomic design, higher levels of precision, and imitation of wrist movements with a wider range of motion contribute to the success of robotic platforms.[2,3,7] With these advantages, robotic-assisted cholecystectomy (RC) and robotic-assisted appendectomy (RA) are considered safe and effective with results without the need for conversion to laparoscopy or open surgery.[4,6] Compared to laparoscopy, robotic-assisted has the advantages of minimal bleeding and faster postoperative healing time. However, robotic-assisted surgery remains controversial due to its high cost and longer operating time.[1,8] Publications on minimally invasive robotic-assisted surgery in Indonesia are currently limited. Here, we report the experience of two cases involving cholecystectomy and appendectomy using the Da Vinci robotic-assisted surgery platform at a hospital in Jakarta, Indonesia.

CASE REPORT

Case 1: Cholecystitis and Cholelithiasis

Lorem A 54-year-old man presented with complaints of worsening upper right abdominal pain over the past year. He underwent a medical check-up and was diagnosed with multiple cholelithiasis based on an abdominal ultrasound examination. Similar findings were noted during a previous medical check-up conducted several years ago, but the patient had no complaint before. Over the past year, the patient has been experiencing intermittent pain in the upper right abdomen. During a routine medical check-up, an abdominal ultrasound revealed multiple cholelithiasis that have increased in size and number compared to the patient's previous ultrasound examination

The patient with overweight risk factors (BMI: 29.7 kg/m2) and a history of consuming a significant amount of fatty foods was admitted. The physical examination found pain in the right upper quadrant abdomen (Murphy's sign) and laboratory examination showed dyslipidemia. The patient underwent a RC procedure while positioned supine. After preparing the operating area with aseptic and antiseptic, four trocars were inserted, and pneumoperitoneum was performed. During the surgery, inflamed bile was found, the calot's triangle was identified, The cystic artery and cystic duct were clamped and cut, then bile removed (Figure 1.). The operation was completed with a very minimal amount of bleeding (10 ml). An anatomical pathology examination of the gallbladder tissue was performed.

The patient underwent postoperative observation during hospitalization and received pain relief medication, antiemetics, proton pump inhibitors (PPIs), and broad-spectrum antibiotics. The patient experienced nausea and vomiting after surgery. However, within less than 24 hours, the patient showed good recovery with minimal postoperative pain, resolution of nausea and vomiting, normal bowel activity, good oral intake, and ability to mobilize well, so that the patient was discharged to continue outpatient care.

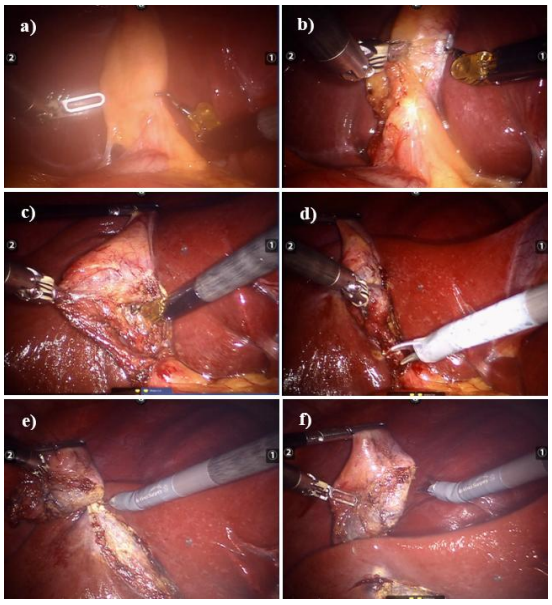

Figure 1. The process of robotic-assisted cholecystectomy surgery. a) The presence of an inflamed gallbladder has been identified. b) Calot's triangle was identified. c) cystic artery and cystic duct were clamped, d) transection is performed. e) the Cholecystectomy is performed. f) The gallbladder was then excised from the surgical field.

Case 2: Appendicitis with problems in the field of gynecology and urology

Lorem A 44-year-old woman was referred to a digestive surgeon due to the finding of bowel adhesions from an MRI examination. Previously, the patient had been experiencing prolonged menstruation and lower abdominal pain over the past year, with menstruation lasting 1-2 weeks and heavy bleeding requiring 4-5 pad changes daily. The lower abdominal pain occurred both before and during menstruation, with occasional occurrences outside of the menstrual cycle. There was no fever, change in bowel habits, or urination complaints.

The patient was diagnosed with uterine fibroids in 2012 and had undergone surgery. However, over the past year, she experienced prolonged menstruation leading to a hemoglobin level of 7 mg/dL due to heavy menstrual bleeding. On abdominal examination, a palpable solid and immobile mass was noted in the suprapubic area, without tenderness in the abdominal region. There was no tenderness upon palpation of

McBurney's point, and obturator, psoas, and rovsing signs were negative.

The MRI results showed intramural submucosal uterine fibroids, pedunculated uterine fibroids, uterine adenomyosis, endometriomas, ovarian cysts accompanied by right hydrosalpinx, right hydronephrosis, and right hydroureter due to pressure from the cystic mass in the right adnexa, suspected to be an endometriosis. Additionally, the sigmoid colon boundary at the superior fundus of the uterus appeared blurred, with enhancement on the anterior wall of the right-sided abdominal cavity, suggesting bowel adhesions without signs of obstruction.

Based on clinical presentation and radiological findings, the patient was advised to undergo total laparoscopic hysterectomy (TLH) and right oophorectomy using robotic-assisted surgery, DJ stent placement, and exploration of bowel adhesions. The procedure began with the placement of a right DJ stent and insertion of a left ureteral catheter. Subsequently, the robotic procedure was initiated by making four port incisions and installing four trocar ports. Extensive adhesiolysis was performed due to adhesions involving both adnexa. The procedure continued with total hysterectomy and right oophorectomy performed by coagulation. Coagulation was also performed to control bleeding on the rectal serosa. During the operation, an inflamed appendix was identified, leading to appendectomy. The appendectomy procedure started with hemostasis on the mesoappendix, followed by endoloop placement and appendiceal sectioning. The tissue was removed using a morcellator, and the incision was sutured. Histological examination of the appendix tissue revealed acute appendicitis with endometriosis The appendectomy procedure lasted 5 minutes with a total bleeding of 5 ml and no intraoperative complications related to the appendectomy procedure were found.

After the operation, the patient was observed in the postoperative ward. Within less than 24 hours of observation, the patient reported minimal postoperative pain, good mobilization, normal bowel activity, no urinary issues, and the surgical wound was in good condition with no signs of infection. As a result, the patient was discharged for outpatient follow-up, with plan to remove the DJ stent two weeks postoperatively. During the outpatient follow-up visit, no complications such as wound infection, pain, or mobility limitations were found.

DISCUSSIONS

The use of robotic platforms in general surgical procedures has rapidly increased. However, despite the growing number of robotic procedures, research comparing RC with laparoscopic cholecystectomy (LC) is limited.[6] In Li's study, Yu-Pei et.al showed that RC had significantly fewer postoperative complications than LC.[9] Similar findings have been reported in the Aylo et.al study showing that there was no conversion to open cholecystectomy in RC and no major complications such as bile duct or hepatic artery injury, bile leakage, reoperation, or accidental injury to surrounding structures or death.[6] Studies by Kane, William J, et.al showed that RC takes longer time and is associated with higher hospital costs, but clinical outcomes are also better than laparoscopic procedures. The study also found that no patients needed readmission to the hospital within 90 days after RC, compared to 43 patients (4.1%) who had to be readmitted within 90 days after laparoscopic cholecystectomy. These findings may be attributed to improved robotic-assisted techniques and dissections, leading to a reduction in postoperative complications.[17]

The robotic platform also benefit surgical operators with a better 3D visual field and endowrist instruments that mimic wrist movements with a wider range of motion, enhancing precision and reducing tremors These advantages make robotic-assisted surgery more promising than laparoscopy.[2,3] Although robotic-assisted surgery is increasingly utilized worldwide, particularly in digestive surgeries like cholecystectomy, its application in appendectomy remains limited due to cost concerns and a lack of widespread research publications related to RA.[8]

Becker et al. compared the outcomes of laparoscopic appendectomy outcomes (49,800 patients) with RA (50 patients). RA demonstrated a notable advantage with reduced length of hospital stay (average duration ranging from 0.7 to 1.1 days) compared to LA procedures (1.3 to 2.9 days).[8] Kelkar et al reported the length of hospitalization of 4 acute appendicitis patients undergoing RA in emergency conditions was 4 days (2-7 days).[10] Similarly, Yao et al also reported the length of hospitalization of 3 acute appendicitis patients who underwent RA in emergency conditions for 6 days.[11]

Kelkar et al. reported estimated blood loss of less than 5 ml among 4 patients with acute appendicitis who underwent RA under emergency conditions, while Yao et al. reported estimated blood loss of 40 ml among 3 patients with acute appendicitis who underwent RA.[10,11] Hutternbrik et al. noted that patients undergoing elective RA during Robotic-assisted Radical Prostatectomy (RALPR) did not experience any operation-related complications, but rather readmissions due to RALPR procedure complications.[12]

RA is also deemed effective, with outcomes showing no conversions to either LA or open surgery, minimal bleeding, and lower rates of procedure-related readmissions.[4] The average total operating time of RA (71 minutes) is longer than LA (46 minutes). However, it is known that complex cases may extend the duration of the procedure.[8] It is also known that RA is often performed in conjunction with other surgical procedures, such as gynecology and urology, rather than true acute appendicitis.[4,8,13] Akl et al. demonstrate that the mean duration of RA surgery, when isolated from the total operative time performed

simultaneously, is 3.4 minutes.[14] The length of operation time is also operator-dependent, whereas the length of operation time can be faster for more experienced operators. Additionally, it is essential to consider the duration of preparation time for the pre-operative robot, including the time required for docking the robot.[13,14]

Overall, robotic-assisted surgery costs more than laparoscopy, including RC and RA.[8,15] The high cost depends on several factors such as the cost of purchasing the robot, maintenance costs, disposable materials, and longer operating times.[16] Singh A. et al. reported a cost of $9,370.06 for LC resulting in 0.9722 quality-adjusted life-years, while RC resulted in an additional 0.0017 quality-adjusted life-years at an additional cost of $3,013.64, equating to an additional cost per quality-adjusted life-year of $1,795,735.21.[16] However, considering the shorter duration of hospitalization with RC and RA procedures and other advantages, there are advantages of cost and patient satisfaction aspects that need to be considered.

In our case, we highlight the utility of robotic platforms for cholecystectomy and appendectomy procedures. Robotic-assisted surgery provides greater precision in surgical procedures and reduces the risk of damage to surrounding tissues. Robotic-assisted surgery has helped patients experience faster recovery. Patients are able to mobilize early postoperatively and undergo recovery without pain or complications, so the patients can be discharged after 24-hour monitoring. Additionally, robotic procedures result in smaller surgical wounds, providing optimal cosmetic outcomes. Robotic platforms with 3D visualization also provide significant benefits to surgical operators during the procedure. With accurate and detailed three-dimensional images, it allows clearer identification of the internal structures of the abdomen, thereby enhancing precision, procedure success, and overall patient outcomes. These technological advancements contribute to the effectiveness and safety of robotic-assisted surgery in cholecystectomy and appendectomy.

CONCLUSION

Robotic-assisted cholecystectomy (RC) and robotic-assisted appendectomy (RA) are highly safe procedures and demonstrate higher efficacy compared to laparoscopic methods in treating cholecystitis and appendicitis. Robotic technology enhances surgical precision, which reduces the risk of complications and accelerates the patient's recovery phase. As technology continues to advance, it is expected that robotic-assisted surgery can be widely applied for elective or emergency surgery in Indonesia.

REFERENCES

1. Strosberg, D.S., Nguyen, M.C., Muscarella, P. *et al.* A retrospective comparison of robotic cholecystectomy versus laparoscopic cholecystectomy: operative outcomes and cost analysis. *Surg Endosc* 31, 1436–1441 (2017). https://doi.org/10.1007/s00464-016-5134-0
2. Ran L, Jin J, Xu Y, Bu Y, Song F. Comparison of robotic surgery with laparoscopy and laparotomy for treatment of endometrial cancer: A meta-analysis. PloS One 2014; 9:e108361. https://doi.org/10.1371/journal.pone.0108361.
3. Roh HF, Nam SH, Kim JM. Robot-assisted laparoscopic surgery versus conventional laparoscopic surgery in randomized controlled trials: A systematic review and meta-analysis. PloS One 2018; 13:e0191628. https://doi.org/10.1371/journal.pone.0191628.
4. Arang H, Boghdady ME. Robotic appendectomy: a review of feasibility. Sultan Qaboos University Med J. 2023 Nov 23; 4:440-6. https://doi.org/10.18295/squmj.7.2023.043
5. Milone, M. MD, PhD; Vertaldi, S. MD; Bracale, U. MD; D'Ambra, M. MD; Cassese, G. MD; Manigrasso, M. MD*; De Palma, G.D. MD. Robotic cholecystectomy for acute cholecystitis: Three case reports. Medicine 98(30):p e16010, July 2019. | DOI: 10.1097/MD.0000000000016010
6. Ayloo, S., Roh, Y., & Choudhury, N. (2014). Laparoscopic versus robot-assistedcholecystectomy: A retrospective cohort study. International Journal of Surgery, 12(10), 1077–1081. doi:10.1016/j.ijsu.2014.08.405
7. Tamas J. Vidovszky; William Smith; Jagannath Ghosh; Mohamed R. Ali (2006). Robotic Cholecystectomy: Learning Curve, Advantages, and Limitations. , 136(2), 0–178. doi:10.1016/j.jss.2006.03.021
8. Becker T. DeLeon G, Rao V, Pei KY. A comparison of outcomes between laparoscopic and robotic appendectomy among ACS-NSQIP hospitals. Laparosc, Endosc, and Robotic Surg. 2023; 6:2:39-42. https://doi.org/10.1016/j.lers.2023.04.003.
9. Li, Yu-Pei; Wang, Shen-Nien; Lee, King-Teh (2017). Robotic versus conventional laparoscopic cholecystectomy: A comparative study of medical resource utilization and clinical outcomes. The Kaohsiung Journal of Medical Sciences, 33(4), 201–206. doi:10.1016/j.kjms.2017.01.010
10. Kelkar D, Borse MA, Godbole GP, Kurlekar U, Slack M. Interim safety analysis of the first-in-human clinical trial of the Versius surgical system, a new robot-assisted device for use in minimal access surgery. Surg Endosc 2021; 35:5193–202. https://doi.org/10.1007/s00464-020-08014-4.
11. Yao Y, Liu Y, Li Z, Yi B, Wang G, Zhu S. Chinese surgical robot micro hand S: A consecutive case series in general surgery. Int J Surg 2020; 75:55–9. https://doi.org/10.1016/j.ijsu.2020.01.013.
12. Hüttenbrink C, Hatiboglu G, Simpfendörfer T, Radtke JP, Becker R, Teber D, et al. Incidental

appendectomy during robotic laparoscopic prostatectomy-safe and worth to perform?. Langenbeck's Arch Surg 2018; 403:265–9. https://doi.org/10.1007/s00423-017-1630-5.
13. Soomro NA, Hashimoto DA, Porteous AJ, Ridley CJA, Marsh WJ, Ditto R, Roy S. Systematic review of learning curves in robot-assisted surgery. BJS Open. 2020 Feb;4(1):27-44. doi: 10.1002/bjs5.50235.
14. Akl MN, Magrina JF, Kho RM, Magtibay PM. Robotic appendectomy in gynaecological surgery: technique and pathological findings. Int J Med Robot. 2008 Sep;4(3):210-3. doi: 10.1002/rcs.198
15. Ng AP, Sanaiha Y, Bakhtiyar SS, Ebrahimian S, Branche C, Benharash P. National analysis of cost disparities in robotic-assisted versus laparoscopic abdominal operations. Surgery. 2023 Jun;173(6):1340-1345. doi: 10.1016/j.surg.2023.02.016
16. Singh, A., Panse, N. S., Prasath, V., Arjani, S., & Chokshi, R. J. (2023). Cost-effectiveness analysis of robotic cholecystectomy in the treatment of benign gallbladder disease. Surgery. Advance online publication. https://doi.org/10.1016/j.surg.2023.01.017
17. Kane, William J.; Charles, Eric J.; Mehaffey, J. Hunter; Hawkins, Robert B.; Meneses, Kathleen B.; Tache-Leon, Carlos A.; Yang, Zequan (2019). Robotic compared with laparoscopic cholecystectomy: A propensity matched analysis. Surgery, (), S0039606019305264–. doi:10.1016/j.surg.2019.07.020