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Case Series Report

A Comparison Between the Surgical Outcomes of Robotic vs Laparoscopic Cholecystectomies: A Case Series Report

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Abstract

Background: Minimally invasive surgery, including laparoscopic cholecystectomy (LC), is preferred for quicker recovery, reduced infection risk, and better cosmetic results. LC has been the standard for gallbladder disease since the 1990s, with 78,000 procedures in the UK in 2023. Robotic-assisted cholecystectomy (RC), introduced in 2002, offers improved precision, dexterity, and 3D visualisation, potentially reducing tissue trauma and recovery time. However, RC is more expensive but shows better outcomes in complex cases. Present studies suggest similar outcomes for both methods.

Methods: All patients undergoing robotic or laparoscopic cholecystectomy at the university hospital were identified using the institutional clinical data repository.

This study was structured as a retrospective case series. Patients were stratified into two groups by operative approach and further comparisons were carried out based on pre and post op clinical outcomes.

Results: Six patients in total were a part of this case series; with three each who underwent an LC and an RC respectively. There were no significant differences in demographics or BMI, and no significant differences in pre op co morbidities. Patients that underwent a robotic cholecystectomy had longer operative durations, as well as a marginally longer post op hospital stay as compared to patients who underwent a laparoscopic procedure.

Conclusion: Laparoscopic cholecystectomy is associated with shorter operating times and hospital stay as compared to RC. Surgeon comfort levels and availability, hospital costs and patient preference should dictate whether cholecystectomies are approached robotically or laparoscopically.

Keywords: Robotics; Cholecystectomy; Laparoscopy; Surgery

Abbreviations

LC: Laparoscopic Cholecystectomy; RC: Robotic Cholecystectomy; CY: Cholecystectomy; Hb: Haemoglobin; ESR: Erythrocyte Sedimentation Rate

Introduction

Minimally invasive surgery is often considered superior to traditional open surgery due to a number of reasons. These include quicker recovery times, reduced risk of infection and better aesthetic results [1]. Laparoscopic cholecystectomy has been the mainstay of

managing complicated gallbladder disease since the 1990's, with 78,000 performed in 2023 in the UK alone [2]. Robotic assisted cholecystectomy is a recent innovation in the field with the first being performed in Italy in 2002, utilising the da Vinci system. RC offers enhanced capabilities over LC including improved dexterity, enhanced precision and the ability to view the surgical site in three dimensions. These improvements have the potential to cause less tissue trauma compared to LC, possibly leading to shorter recovery times. Despite these advantages, RC has an increased expense, and its improved surgical outcomes have only been demonstrated in complex and high-risk cases [3]. For routine surgeries, LC remains a highly effective and cost-efficient option.

Until recently there has been limited data comparing the efficacy of the two approaches, however in the last five years there have been a number of multinational meta-analyses that have demonstrated similar surgical outcomes. We carried out a retrospective study that included six cholecystectomies at our hospital from July to August of 2023. Three of which were performed robotically, whilst the other three were performed laparoscopically. The aim of this study was to conduct a comparative analysis between RC and LC, primarily considering the surgical outcomes and exploring any benefits of either. In doing so, we wish to discuss if there are indications for RC overtaking LC as a routine procedure and add to growing literature in the field.

Methods

This retrospective case series was carried out in subsets of patients who underwent both LC and RC; with a set of three patients in each subgroup; at the university hospital oncosurgical department between July to August 2023. The proposed causes for the patients undergoing such procedures were varied; and ranged from cholelithiasis and proposed malignancy to cholecystitis. All of the data used in this series was collected from patient notes, which include but were not limited to: pre op clerking, lab tests specific to patients' conditions, standard pre op tests, intra op notes from the anaesthesiologist, post op notes and labs, discharge summaries and TTOs.

On the basis of this collected and available data, the patient variables were weighed against each other using 13 different parameters: Indication for surgery, Date of admission and operation, Duration of operation, Post op length of stay, Date of discharge, 1 day prior Hb counts, post op Hb count, day 1 and 3 post op Hb counts, 1 day prior ESR count, post op ESR count, day 1 and 3 post op ESR count, American Society of Anaesthesiologists (ASA) classification and Clavien Dindo classification on post op day 1 and 3.

Results and Discussion

The main comparative outcomes that had a significant difference were the duration of the operation; which is congruent with a similar study carried out by [4] and post op hospital stay.

There were no other significant differences or anomalies in any of the other data that was collected. The mean age of the patients undergoing this procedure was 45 years, and most of the lab values measured both preceding the procedure and after; were relevant for patient age, sex, and lifestyle factors. The measured ESR rates were not elevated beyond normal ranges and all patients were given the same post op medications and instructions. All of the patients were graded a 2 on the ASA classification system (most drank or smoked as is common culturally, or had comorbidities like controlled diabetes/hypertension); all of the patients were classified as a grade 1 on the Clavien Dindo scale as well, with close to no post op complications and a regular therapeutic drug regimen of antipyretics, analgesics, electrolytes and physiotherapy. The measured mean operative time for RC procedures was 150 minutes, that of the LC was 115 minutes. The measured mean of the post op hospital stay is a significantly closer comparison; with it being 2.6 days for RC and 2.3 days for LC. This study is limited in its approach due to its retrospective nature, small patient subset and available clinical data. It could potentially be made better by observing these parameters in a more longitudinal setting and in a larger population.

Conclusion

The longer operative times taken for a RC can be explained by the complexity of the setup. On average it takes longer to organise a robotic setup as compared to a laparoscopic one, which accounts for the longer durations.

The availability of trained surgeons, and suitable OTs as well as the general cost of the procedure was not compared as these were not entirely relevant in the settings. The study could have been significantly advanced with the consideration of these

parameters; specifically, a monetary perspective; however, this was excluded because of the prevalence of insurance coverage in the country covering the majority of the costs. Kane., *et al*. sheds some necessary light on the importance of this parameter.

While it may seem like a limitation or a narrow view; the lack of cost efficiency and surgeon expertise as a variable, brings to true perspective the efficacy of these procedures; and allows an unbiased comparison as to whether one is truly superior to the other in the field of MIS. [5] mentions that a laparoscopic procedure is safer and much more justified under circumstances, but we believe that both surgical modalities are equally viable and justifiable minimally invasive procedures, and the only deciding factor should ideally be the patient's preference [6,7].

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