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Original Article

Effect of clinical anesthesia preoperative evaluation on the length of preoperative period and total hospitalization of patients undergoing laparoscopic cholecystectomy

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Abstracts: Objective: Anesthesia preoperative evaluation clinics (APECs) are currently operating in several South Korean hospitals. While several studies have investigated the impact of APEC operations on the length of total hospital stay (LTHS), few have investigated their impact on the length of preoperative hospital stay (LPHS) for patients. In this study, we aimed to determine whether APEC affected the LPHS and LTHS. Methods: Data of all patients who underwent surgery at Chungbuk National University Hospital between September 2009 and August 2019 were analyzed retrospectively. All patients who had undergone laparoscopic cholecystectomy over the last 10 years were categorized into two groups: those who visited the APEC (Group A), and those who did not (Group B). The age, sex, American Society of Anesthesiologists physical status score, LPHS, and LTHS of the two groups were compared. Results: The LPHS was 1.03±0.2 days in Group A and 1.61±1.6 days in Group B. The LTHS was 4.77±1.9 days in Group A and 5.63±2.6 days in Group B. The LPHS and LTHS of the two groups differed by 0.58 and 0.9 days, respectively. Conclusion: We evaluated the effect of APEC operations on the LPHS and LTHS of inpatients undergoing laparoscopic cholecystectomy and observed a decrease in both the LPHS and LTHS. Understanding and accepting the importance of APEC is significant for physicians and administrators working to improve hospital efficiency and patient outcomes. Further research is needed to investigate the need and benefits of APECs.

Keywords: Length of stay, outpatients, preoperative care, preoperative period

Introduction

The ultimate goal of pre-anesthetic patient evaluation is to reduce perioperative morbidity and mortality, restore the patients' physical functions as quickly as possible, and help them return to their daily lives [1]. Depending on the time and location, pre-anesthetic patient evaluation in South Korea currently consists of two steps: the first step is conducted at an outpatient anesthesia preoperative evaluation clinic (APEC) during the early stages of surgical planning (i.e., immediately after the decision to perform surgery and before hospitalization), and the second evaluation is performed a day before the surgery for assessment of the hospitalized patients.

Several Korean hospitals feature APECs. One study has shown that APECs may reduce surgical delays and cancelation rates from 13% to 5% [2], while another has shown that APECs may reduce surgical cancelations due to medical reasons [3], such as uncontrolled hypertension, by 30%, as well as the need for additional tests (e.g., electrocardiography, chest radiography, laboratory tests) during admission and before the surgery. Additionally, the operations of APECs have been associated with a significant reduction in attendant care medical expenses incurred by the patient [4] as well as that of patient mortality in hospitals [5].

Accordingly, APEC operations may be expected to have a considerable impact on the length of

preoperative hospital stay (LPHS) and the length of total hospital stay (LTHS) for a patient. While several studies have investigated and reported the impact of APEC operations on LTHS [4, 6, 7], few have investigated their impact on LPHS. This study explored the hypothesis that APEC operations may reduce LPHS as well as LTHS, after controlling for sex, age, and American Society of Anesthesiologists physical status (ASA) scores.

Materials and methods

This study was approved by the Clinical Research Review Committee (institutional review board) (approval number: 2019-12-026) and used data provided by the Medical Information Department of Chungbuk National University Hospital.

General data

Data of all patients who underwent surgery at our hospital between September 2009 and August 2019 were analyzed retrospectively. We extracted data on the patients' age, sex, American Society of Anesthesiologists physical status score, admission date, operation date, and discharge date. The LPHS and LTHS were calculated using the admission date, operation date, and discharge date; the former ranged from the admission to operation date, and the latter from the admission to discharge date.

Inclusion and exclusion criteria

Inclusion criteria: All patients who had undergone laparoscopic cholecystectomy (LC), which has been the most frequent surgery performed at Chungbuk National University Hospital for the last 10 years, were included in the study.

Exclusion criteria: The following exclusion criteria were employed: emergency surgery, admission by another department, history of ≥2 surgeries, age >65 years, ASA score ≥3, and patients whose surgical modality was converted to open cholecystectomy. The criteria for patient enrollment in this study helped to ensure that our findings could be attributed to the inception of the APEC. Patients receiving emergency surgery or admission by another department were excluded because they were unable to visit the APEC. Patients who had previously undergone surgery were excluded because they had already received a pre-anesthetic evaluation.

Several studies have reported longer LTHS in patients with ASA scores of 3 or 4 than in those with scores of 1 or 2 [8, 9]. Thus, we excluded patients with ASA scores of 3 or 4 to maintain the validity of our comparison.

Further, several studies have observed an association between lengthened LTHS and the age of patients undergoing LC [10-13]. Lo et al. [14] observed that postoperative hospitalization increased to 1.1 days and LTHS increased to 3.8 days in patients aged >65 years. Matin et al. [15] reported that LTHS increases by 19 h if the patient's age exceeded 65 years. Therefore, we excluded patients >65 years to maintain the validity of our comparison.

Additionally, several studies have reported significantly longer postoperative hospitalization in patients undergoing open cholecystectomy than that in patients with LC [16]; hence, we also excluded patients with LC in whom the modality was converted to open surgery.

Grouping

Patients who visited the APEC were classified into Group A, and those who did not were classified into Group B. We compared the age, sex, ASA score, LPHS, and LTHS of the two groups.

Statistical analysis

All statistical analyses were performed using Statistical Package for the Social Sciences version 25.0 for Windows (IBM Corporation, Armonk, New York). The chi-squared test was used to analyze the differences between sex and ASA scores. Independent-samples t-tests were used to compare age, LPHS, and LTHS. A P-value <0.05 was considered statistically significant.

Results

Group A included 735 patients (317 men; average age, 45.39±11.1 years), and Group B included 919 patients (425 men; average age, 46.11±10.7 years). The distribution of age (P=0.186), sex (P=0.198), and ASA scores (P=0.232), did not differ significantly between the two groups (**Table 1**; **Figure 1**).

The average LPHS was 1.03±0.2 days in Group A, and 1.61±1.6 days in Group B. The average LTHS was 4.77±1.9 days in Group A, and 5.63±2.6 days in Group B. The LPHS and LTHS

Table 1. Patient demographics

Classification	Group A (n=735) mean (± SD)	Group B (n=919) mean (± SD)	*P*-value
Age (years)	46.11 (±10.7)	45.39 (±11.1)	0.186
Sex			0.198
Male	317	425	
Female	418	494	
ASA score			0.232
1	509	611	
2	226	308	

Note: Values are presented as a number or as the mean ± standard deviation (SD). Group A: patients who visited the anesthesia preoperative evaluation clinic. Group B: patients who did not visit the anesthesia preoperative evaluation clinic. ASA, American Society of Anesthesiologists physical status; SD, standard deviation; n, number.

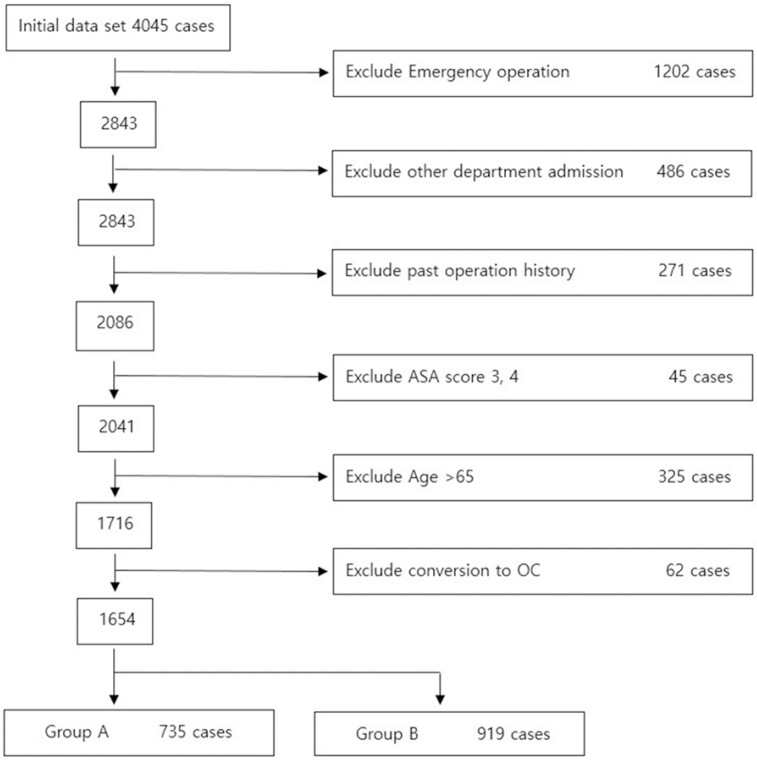

Figure 1. Exclusion criteria and identification of cohorts for analysis. ASA, American Society of Anesthesiologists physical status; OC, open cholecystectomy; Group A, patients who visited the anesthesia preoperative evaluation clinic; Group B, patients who did not visit the anesthesia preoperative evaluation clinic.

of the two groups differed by 0.58 and 0.9 days, respectively (**Table 2**; **Figure 2**).

Discussion

Before the establishment of the APEC, preanesthetic evaluations were performed in the ward a day before surgery, which resulted in cancelation or delay of the surgery if the necessary evaluation was not performed for anesthesia and/or surgery. This, in turn, led to unnecessary extension of the duration of hospitalization. Further, the preventable extension of the patients' LPHS and LTHS, and the cancelation of surgical procedures compromised the efficiency of the hospital's operating room. Moreover, the anesthesiologist was forced to make multiple trips if the patient was away from the ward bed, exacerbating the lack of efficiency.

To resolve these issues, our hospital has been operating an APEC on weekdays between 2 pm and 6 pm since September 2014. A patient is usually referred to the APEC 1 week to 1 month before their scheduled surgery date. At the APEC, a professor, resident, and nurse from the Department of Anesthesia and Pain Medicine perform the pre-anesthetic patient evaluation, inform him/her about the method of the anesthesia and its risks, and obtain the patient's consent to perform anesthesia.

Our APEC annually treated 3618, 4599, 4541, 4365, and 4601 patients respectively, between 2014 and 2019. This patient volume accounts for approximately 80% of our surgical patients, and the APEC visitation rate has risen from 0.7545 in its first year to 0.8355 in the most recent year (**Figure 1**).

This study found that during the 5-year operation of the APEC, the LPHS and LTHS of patients undergoing LC was reduced by an average of 0.58 and 0.9 days, respectively. We surmise

Table 2. Lengths of preoperative and total hospital stay according to use of the anesthesia preoperative evaluation clinic

	Group A (n=735) mean (± SD)	Group B (n=919) mean (± SD)	*P*-value
Length of preoperative hospital stay (days)	1.03 (±0.2)	1.61 (±1.6)	0.00
Length of total hospital stay (days)	4.77 (±1.9)	5.63 (±2.6)	0.00

Note: Values are presented as mean ± standard deviation (SD). Group A: patients who visited the anesthesia preoperative evaluation clinic. Group B: patients who did not visit the anesthesia preoperative evaluation clinic.

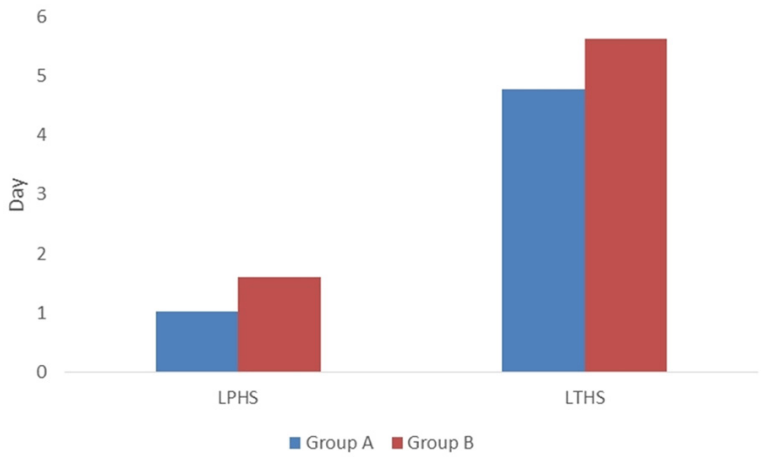

Figure 2. Comparison of the length of preoperative hospital stay and length of total hospital stay. Group A: patients who visited the anesthesia preoperative evaluation clinic. Group B: patients who did not visit the anesthesia preoperative evaluation clinic. LPHS, length of preoperative hospital stay; LTHS, length of total hospital stay.

that the reduction in LPHS accounts for that of the LTHS as well. Several studies have reported a reduction in LPHS [4, 6, 17, 18]; however, in most cases, these results were due to an increase in the number of same-day admissions or in the number of patients scheduled for outpatient-surgery. The reduction in LPHS we obtain differs from that in a previous study, as in that it was a result obtained by excluding same-day admissions and outpatient-surgery patients. Although the decrease in LPHS in our study may seem numerically inconspicuous at 0.58 days, it is by no means a small figure, considering that the average LTHS for both groups was 5.2 days. Moreover, it is encouraging that these results were obtained in the patient group, as opposed to the same-day admissions and outpatient-surgery group.

There are several factors affecting the LPHS. The delay or cancelation of surgeries reduces the operational efficiency of the operating room by unnecessarily increasing the LPHS. Moreover, performing medical tests that can be performed in the outpatient department during hospitalization further increases the LPHS unnecessarily, which in turn reduces the efficiency of bed utilization. Several studies reported that the APEC can reduce the number of surgical delays and cancelations as well as additional medical tests required during admission [3, 19, 20]. Thus, APEC operations may lead to a decrease in the LPHS.

The limitation of this study is that owing to the shortcomings of our hospital's medical information system, we were unable to analyze the surgery cancelation rates, which may have affected the LPHS and LTHS in the study sample. Moreover, the extent of surgeons' satisfaction with the APEC was not measured; Park et al. [21] have reported on the significance of surgeons' satisfaction regarding the use of the APEC. Considering the presently observed reductions in the LPHS and LTHS affected by the APEC, it is expected that the results of this study may further contribute to increasing surgeons' satisfaction.

We evaluated the effects of APEC operations on the LPHS and LTHS of inpatients undergoing LC and observed a decrease in both the LPHS and LTHS. APEC operations are also associated with a reduction in surgery cancelations and delays, lower medical expenses incurred by the patient, decrease in hospital mortality, and surgeons' satisfaction [2-5]. Considering these advantages, we suggest that understanding and accepting the importance of APEC is significant for physicians and administrators work-

ing to improve hospital efficiency and patient outcomes. Moreover, future research is needed to investigate the need and benefits of APECs, including their impact on the LPHS and LTHS of the patients.

Disclosure of conflict of interest

None.

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