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ORIGINAL ARTICLE

Day or night? The right time to perform cholecystectomy

¿Día o noche? El momento ideal para realizar la colecistectomía

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Abstract

Introduction. The frequency of post-surgical complications of cholecystectomy performed overnight is a matter of controversy, and a higher rate has been reported during the night shift. The objective of this study was to analyze the presentation of difficult cholecystectomy depending on the time the surgery was performed, in addition to other complications, postoperative hospital stay, 30-day readmission, and reintervention.

Methods. A retrospective, observational, analytical and cross-sectional study was carried out, comparing the presentation of difficult cholecystectomy and its frequency during daytime (8:00 am to 7:59 pm) and at night (8:00 pm to 7:59 am), in addition of seroma, abscess, bile leak, biloma, hematoma, post-surgical hospital stay, 30-day readmission, and reintervention.

Results. A total of 228 patients were included in the study, 117 patients operated during the day (52%), and 111 at night (48%). Difficult cholecystectomy occurred in 26% vs. 34% of the cases operated on during the day and at night, respectively. The most frequent complication was seroma (14%). The mean hospital stay was 2.7 days in day surgeries and 2.5 in night surgeries; there were also 2% readmission at 30 days among patients operated during the day and 3% among those operated on at night.

Conclusions. The frequency of difficult cholecystectomy and complications, postoperative hospital stay, 30-day readmission, and the need of reintervention, did not have significant differences with respect to the time of surgery.

Keywords: laparoscopic cholecystectomy; intraoperative complications; postoperative complications; conversion to open surgery; work schedule.

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Resumen

Introducción. La frecuencia de complicaciones postquirúrgicas de la colecistectomía realizada en la noche es un tema de controversia, siendo que se ha reportado una frecuencia mayor durante el horario nocturno. El objetivo de este estudio fue analizar la presentación de colecistectomía difícil dependiendo de la hora en que se realizó la cirugía, además de otras complicaciones, estancia intrahospitalaria postquirúrgica, reingreso a 30 días y reintervención.

Métodos. Se realizó un estudio retrospectivo, observacional, analítico y transversal, comparando la presentación de colecistectomía difícil y su frecuencia en horario diurno (8:00 am a 7:59 pm) y nocturno (8:00 pm a 7:59 am), además de seroma, absceso, hematoma, fuga biliar, biloma, estancia intrahospitalaria postquirúrgica, reingreso a 30 días y reintervención.

Resultados. Se incluyeron en el estudio 228 pacientes, 117 operados durante el día (52 %) y 111 durante la noche (48 %). La colecistectomía difícil se presentó 26 % vs 34 % de los casos intervenidos en el día y la noche, respectivamente. La complicación más frecuente fue seroma (14 %). La estancia hospitalaria media fue de 2,7 días en cirugías diurnas y de 2,5 en cirugías nocturnas; hubo 3 % de reintervenciones y 6 %, respectivamente. También hubo 2 % de reingresos a los 30 días entre los pacientes operados en el día y 3 % entre los operados en la noche.

Conclusiones. La frecuencia de colecistectomía difícil y las complicaciones, la estancia intrahospitalaria postquirúrgica, el reingreso a 30 días y la necesidad de reintervención, no tuvieron diferencias significativas respecto al horario de la cirugía.

Palabras clave: colecistectomía laparoscópica; complicaciones intraoperatorias; complicaciones posoperatorias; conversión a cirugía abierta; horario de trabajo.

Introduction

Acute cholecystitis (AC) is one of the main diagnoses of admission to the emergency department that requires surgical resolution. Early cholecystectomy after the onset of symptoms is associated with less blood loss, fewer complications, and a shorter postoperative hospital stay, which reduces morbidity[1-2].

Laparoscopic cholecystectomy (LC) is currently the treatment of choice[3-4]. Initially, it was a procedure with a high risk of complications, where the most relevant was injury to the bile duct, most of it due to misidentification of the common bile duct or aberrant anatomy. A wide variety of techniques for performing LC have been described and a series of steps, described by Strasberg as the "critical view of safety", have been proposed to prevent such injuries[5].

Difficult cholecystectomy is defined as a procedure that presents a technical difficulty for the approach. Other elements that are taken into account are more than two attempts with a Veress needle or another alternative method such as the open technique for peritoneal access, dissection of adhesions by electrocautery, the need for special instruments for managing the gallbladder, more than 20 minutes of dissection to identify Calot's triangle, liver bed dissection requiring more than 20 minutes, or gallbladder perforation. Other situations that determine a difficult cholecystectomy are the need to increase the initial skin incision during the removal of the gallbladder, the appearance of bile in the abdominal cavity, the removal time greater than 60 minutes from the start of the needle insertion of Veress and the presence of variant anatomy or the lack of identification of structures, which require another alternative method to complete the surgery[6].

LC is usually performed on an elective basis, so it is mostly done during the day, but sometimes procedures are emergencies and need to be done outside of the day shift, under different circumstances than scheduled patients. Given that hospital resources are limited for the night shift[7,8], the optimal time to perform surgery is still a matter of debate[9].

Performing LC at night has been reported to be associated with a small increased risk of complications. Phatak et al observed that nocturnal cholecystectomy is a predictor of postoperative complications at 30 days[10]. Wu et al found that nocturnal LC is associated with a higher conversion rate, without a decrease in the length of hospital stay or related complications, therefore, they conclude that performing LC at night is not recommended[11]. Siada et al report no difference in complications within 30 days of surgery in patients who underwent cholecystectomy during the day or at night; however, they associate nocturnal LC with a decrease in hospital stay.

The aim of the study was to analyze complications within 30 days after nocturnal laparoscopic cholecystectomy compared to daytime procedures. In addition, we compared the frequency of difficult cholecystectomy per shift, postoperative hospital stay, conversion to open surgery, readmission at 30 days, and need for reoperation.

Methods

A retrospective review of patients who underwent cholecystectomy in a tertiary hospital in Mexico City, between January 1, 2016 and December 31, 2020 was made. Data collection was performed through electronic medical records. Daytime cholecystectomy was defined as occurring between 8:00 am and 7:59 pm, and nocturnal cholecystectomy as occurring between 8:00 pm and 7:59 am the following day.

Through the application of the Tokyo guidelines (2018), the diagnostic algorithm was carried out to identify patients who presented acute cholecystitis, as well as the internal protocol of the hospital to perform a safe cholecystectomy. The presentation of difficult cholecystectomy and the frequency of postoperative complications after daytime and nocturnal cholecystectomies were compared.

Post-surgical complications were defined as any of the following (occurring within 30 days of surgery): seroma, bile leak, abscess, biloma, and hematoma. In addition, the days of postoperative hospital stay, conversion to open surgery, readmission at 30 days and need for reoperation were recorded.

Statistical analysis was performed with the IBM® SPSS® Statistics version 23 program, to compare independent groups with the chi-square test and Fisher's exact test for qualitative variables, and Student's t-test for quantitative variables.

Results

A total of 387 patients operated on in the period described were identified and a total of 228 patients were included in the study (Figure 1), 147 (65%) women and 81 (35%) men. The mean age of the operated patients was 57 years (± 17). The total number of laparoscopic operations was 190 (83%) and the main indication for surgery was AC, which occurred in 179 (79%) cases (Table 1).

One-hundred-seventeen (52%) procedures were performed during the day and 111 (48%) at night. Five types of complications after surgery were analyzed, where seroma was the most frequent complication identified for both shifts, 22 (19%) during the day and 16 (14%) at night (Table 2). The mean hospital stay of patients operated on during the day was 2.7 (± 2.1) days, while the mean hospital stay at night was 2.5 (± 2.5) days (Table 3). No statistically significant differences were found in the demographic characteristics of the patients (age or gender) when they were compared between day and night.

The intraoperative findings described for the surgeries analyzed showed 20 (17%) cases with hydrocholecyst during the day versus 25 (23%) during the night, and 18 (15%) cases with pyocholecyst during the day versus 21 (19%) at night. However, there were no statistically significant differences. During the night, 31 (26%) difficult cholecystectomies were found, compared to the day, with a report of 38 (34%). There was no statistical difference in the incidence of each group between day and night.

Of the 190 laparoscopic cholecystectomies, 94 (49%) were performed during the day, with a 2% conversion rate to open surgery, and 96 (51%) at night, with a 2% conversion rate.

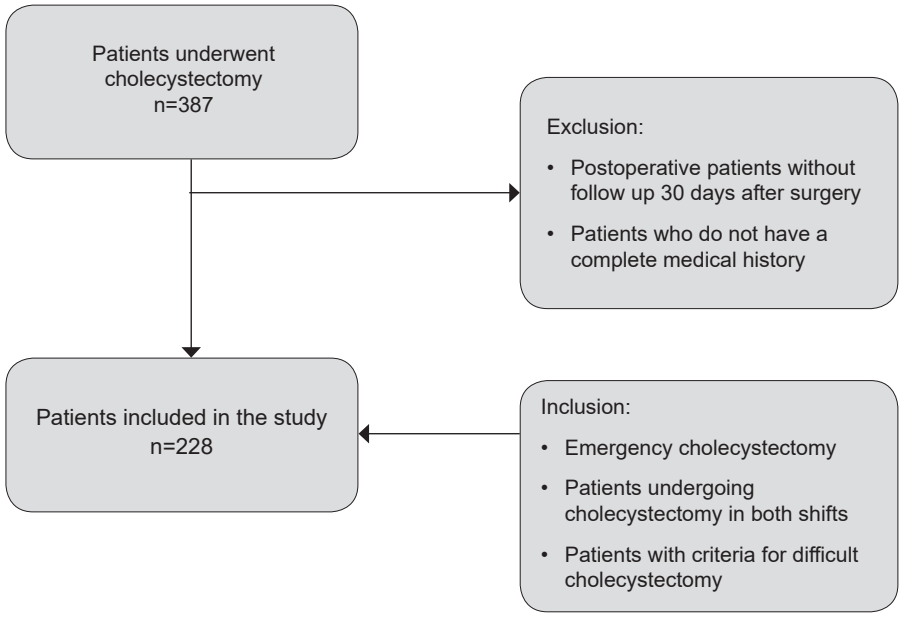

Figure 1. Patient selection flowchart. Source: Authors' records

Tabla 1. Demographic characteristics of patients undergoing cholecystectomy in the period 2016-2020 at the Hospital Central Sur de Alta Especialidad. n=228

Variable	Frequency (%)
Total cholecystectomies	228
Laparoscopic cholecystectomy	190 (83%)
Open cholecystectomy	38 (17%)
Surgeries per shift	
Day	117 (52%)
Night	111 (48%)
Age (years), media ± standard deviation	57 ±17
Gender	
Female	147 (65%)
Male	81 (35%)
Personal history	
Diabetes	74 (33%)
Hypertension	79 (35%)
Smoke	54 (24%)
Alcohol	55 (24%)
Diagnosis greater than a year	48 (21%)
Acute cholecistitis	179 (79%)
Diffciult cholecystectomy	69 (30%)

Source: Hospital Central Sur de Alta Especialidad registry.

Table 2. Postoperative complications in patients undergoing cholecystectomy during the day compared to the night.

	Day (n=117)	Night (n=111)
Variable	**Frequency (%)**	**Frequency (%)**
Seroma	22 (19%)	16 (14%)
Bile leak	7 (6%)	4 (4%)
Abscess	3 (3%)	3 (3%)
Biloma	2 (2%)	1 (1%)
Hematoma	0 (0%)	4 (4%)

Test x2, p=NS
Source: Hospital Central Sur de Alta Especialidad registry.

Table 3. Comparison of postoperative findings of patients undergoing cholecystectomy per shift.

Variable	Day (n=117)	Night (n=111)
Hospital stay	2.7 (± 2,1)	2.5 (± 2,5)
Hydrocholecyst	20 (17%)	25 (23%)
Pyocolecyst	18 (15%)	21 (19%)
Difficult cholecystectomy	31 (26%)	38 (34%)
Conversion to open surgery	2 (2%)	2 (2%)
Reintervention	3 (3%)	6 (6%)
Readmission <30 days	2 (2%)	3 (3%)

Student´s test, p=NS
Source: Hospital Central Sur de Alta Especialidad registry

We found three (3%) reinterventions after day surgeries and six (6%) after night surgeries. There were also two (2%) readmissions at 30 days among patients operated on during the day and three (3%) among those operated on at night. No statistically significant difference was found.

Discussion

Cholecystectomy is one of the most frequent surgeries worldwide. Early cholecystectomy is the treatment of choice for gallbladder disease, either as elective or urgent surgery. AC is the main indication for surgery, found in 53% of our cases[12]. Most of our procedures (71%) were resolved by laparoscopy[3], but laparotomy (open) cholecystectomies continue to be an alternative when the necessary resources are not available or there are difficulties in performing an LC. Although laparoscopic surgery is considered the gold standard, there are selected cases in which the open approach is preferred. The choice of open surgery in our study (17%) was determined for reasons that included the need for intraoperative exploration of the bile duct and patients with a hostile abdomen due to multiple surgeries.

Although both open and laparoscopic cholecystectomies approaches are safe, they are not without complications. Bile duct injury is considered the most feared complication of this procedure, but it has decreased due to the critical view of safety proposed by Strasberg[5]. The complications in our study were seroma, bile leak, abscess, biloma, and hematoma, in order of frequency, without statistically significant differences, although the presence of more cases of hematoma during the night (4%) is noteworthy.

This result is consistent with the studies carried out by Wu et al[11], and Siada et al[8]. However, Phatak et al[10] observed that cholecystectomy at night confers a higher risk of complications (7.4%) compared to surgeries during the day (4%), with a statistically significant difference (p=0.001).

This study noted that performing a cholecystectomy at night does not confer a longer hospital stay (2.7 days) compared to daytime (2.5 days). Siada et al[8] demonstrated that nocturnal surgery shortens hospital stay (2.4 days at night vs. 2.8 days during the day) with a statistically significant difference (p=0.002). Furthermore, Phatak et al[10] identified a shorter hospital stay during cholecystectomy performed at night (2 days) versus cholecystectomy performed during the day (3 days), with statistically significant results (p<0.001) (Table 4).

Pujahari et al[15] included in their study patients who had undergone cholecystectomies and evaluated their readmission 30 days after night surgery, without finding an increase in complications in patients operated at night, with readmission at 30 days of 0.21%. In our study, hospital readmission 30 days after the initial surgery during the daytime was 2%, while 3% of those operated on at night were readmitted, with no significant difference. Hospital readmission in case of reintervention is a problem for patients and their families because it raises treatment costs[16]. In our investigation, readmissions and reinterventions at 30 days were not related to the increase in complications derived from the first surgery.

Sharpe et al[17] carried out a study in which they evaluated complications and hospital readmissions due to surgical procedures, where 35% of the cases observed corresponded to cholecystectomies. In this study, the conversion rate for laparoscopic cholecystectomy was found with the same frequency at both times, contrary to what was published by Wu et al[11], who found that patients who underwent laparoscopic cholecystectomy at night had a higher rate higher conversion rate compared with those who underwent daytime surgery (11.2% vs. 6.2%; p=0.008).

Difficult cholecystectomy occurred with similar frequency during both shifts, 31% during the day versus 38% at night. Some predictors of difficult cholecystectomy have been recognized, and when these risk factors are identified, the best time to perform surgery is during the day, when hospital equipment and resources are not limited. However, a septic process can lead to systemic organ dysfunction if surgery is delayed[18,19], therefore, the best time to perform surgery is still under debate.

Table 4. Comparative studies with postoperative complications, hospital stay and conversion rate of laparoscopic surgery.

	2020 HCSAE* Chama et al. 228 patients		2014 J Am Coll Surg Phatak et al.10 356 patients		2014 Am J Surg Wu et al.11 1140 patients		2017 Am J Surg Siada et al.8 866 patients	
	Day	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
	117	**111**	**248**	**108**	**907**	**233**	**647**	**219**
Post-op complications	34 (29%)	28 (25%)	10 (4%)	8 (7.4%)	59 (6.5%)	12 (5.2%)	53 (8%)	14 (6%)
Hospital stay	2.7	2.5	3	2	3.8	3.7	2.8	2.4
Conversion to open surgery	2 (2%)	2 (2%)	12 (4.8%)	1 (1%)	56 (6.2%)	26 (11.2%)	57 (9%)	9 (4%)

* HCSAE: Hospital Central Sur de Alta Especialidad. Source: own data.

In our study, hydrocholecyst, considered a predictor of difficult cholecystectomy, was found in 17% of the cases operated during the day, compared to 23% during the night, and in the same way, pyocholecyst was observed during the day in 15% of cases vs. 19% at night. For both predictors of difficult cholecystectomy, no statistically significant differences were found in the increase in complications and readmission 30 days after the procedure.

The controversy over the frequency of complications depending on the shift in which the operation is performed has led to the general recommendation to avoid night surgery. However, our results showed no differences to support this recommendation.

Conclusion

No statistically significant difference was found in the frequency of seroma, bile leak, abscess, biloma, and hematoma in the 30-day postoperative follow-up between patients who underwent cholecystectomy during the day compared to the night shift. There was also no difference in hospital stay, conversion from laparoscopic to open surgery, and difficult cholecystectomy when cholecystectomy was performed during the day or at night. In our hospital, as reported worldwide, cholecystectomy can be performed during both shifts thanks to the experience of general surgeons; however, there are other factors that can influence the outcome to perform a successful cholecystectomy, so the risk-benefit must be assessed in each particular case.

Compliance with ethical standards

Informed consent: The institutional ethics committee approved the design and methodology of the study. This study is a retrospective chart review, and as such, there is no need for informed consent.

Conflict of interest: none declared by the authors.

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Author's contributions

- Conception and design of the study: Alejandro Cruz-Zárate.
- Acquisition of data: Alfredo Chama-Naranjo, Fernando Barbosa-Villareal
- Data analysis: Alejandro Cruz-Zárate.
- Data interpretation: Alfredo Chama-Naranjo, Alejandro Cruz-Zárate.
- Drafting the manuscript:: Alfredo Chama-Naranjo, Ana Paula Ruiz-Funes, Fernando Barbosa-Villareal, Jorge Farell-Rivas, Víctor José Cuevas-Osorio.
- Critical review: Alfredo Chama-Naranjo, Ana Paula Ruiz-Funes, Fernando Barbosa-Villareal, Jorge Farell-Rivas, Víctor José Cuevas-Osorio.

References

1. Asai K, Watanabe M, Kusachi S, Matsukiyo H, Saito T, Kodama H, et al. Risk factors for conversion of laparoscopic cholecystectomy to open surgery associated with the severity characteristics according to the Tokyo guidelines. Surg Today. 2014;44:2300-4. https://doi.org/10.1007/s00595-014-0838-z
2. Britt RC, Weireter LJ, Britt LD. Initial implementation of an acute care surgery model: implications for timeliness of care. J Am Coll Surg. 2009;209:421-4. https://doi.org/10.1016/j.jamcollsurg.2009.06.368
3. Geraedts ACM, Sosef MN, Greve JWM, de Jong MC. Is nighttime really not the right time for a laparoscopic cholecystectomy? Can J Gastroenterol Hepatol. 2018;2018:6076948. https://doi.org/10.1155/2018/6076948
4. Chama-Naranjo A; Farell-Rivas J; Cuevas-Osorio VJ. Colecistectomía segura: ¿Qué es y cómo hacerla? ¿Cómo lo hacemos nosotros? Rev Colomb Cir. 2021;36:324-33. https://doi.org/10.30944/20117582.733
5. Strasberg SM, Brunt LM. Rationale and use of the critical view of safety in laparoscopic cholecystectomy. J Am Col Surg. 2010;211:132-8. https://doi.org/10.1016/j.jamcollsurg.2010.02.053
6. Gupta AK, Shiwach N, Gupta S, Gupta S, Goel A, Bhagat TS. Predicting difficult laparoscopic cholecystectomy. Int Surg J. 2018;5:1094-109. https://doi.org/10.18203/2349-2902.isj20180837
7. Chacko AT, Ramirez MA, Ramappa AJ, Richardson LC, Appleton PT, Rodriguez EK. Does late night hip surgery affect outcome? J Trauma. 2011;71:447-53. https://doi.org/10.1097/TA.0b013e3182231ad7
8. Siada SS, Schaetzel SS, Chen AK, Hoang HD, Wilder FG, Dirks RC, et al. Day versus night laparoscopic cholecystectomy for acute cholecystitis: A comparison of outcomes and cost. Am J Surg. 2017;214:1024-7. https://doi.org/10.1016/j.amjsurg.2017.08.027
9. Vinden C, Nash DM, Rangrej J, Shariff SZ, Dixon SN, Jain AK, Garg AX. Complications of daytime elective laparoscopic cholecystectomies performed by surgeons who operated the night before. JAMA. 2013;310:1837-41. https://doi.org/10.1001/jama.2013.280372
10. Phatak UR, Chan WM, Lew DF, Escamilla RJ, Ko TC, Wray CJ, Kao LS. Is nighttime the right time? Risk of complications after laparoscopic cholecystectomy at night. J Am Coll Surg. 2014;219:718-24. https://doi.org/10.1016/j.jamcollsurg.2014.05.009
11. Wu JX, Nguyen AT, de Virgilio C, Plurad DS, Kaji AH, Nguyen V, et al. Can it wait until morning? A comparison of nighttime versus daytime cholecystectomy for acute cholecystitis. Am J Surg. 2014;208:911-8. https://doi.org/10.1016/j.amjsurg.2014.09.004
12. Demirkan A, Tanrıverdi AK, Çetinkaya A, Polat O, Gunalp M. The effect of leucocytosis, gender difference, and ultrasound in the diagnosis of acute cholecystitis in the elderly population. Emerg Med Int. 2019;2019:1-6. https://doi.org/10.1155/2019/6428340
13. Novello M, Gori D, Di Saverio S, Bianchin M, Maestri L, Mandarino FV, et al. How safe is performing cholecystectomy in the oldest old? A 15-year retrospective study from a single institution. World J Surg. 2018;42:73-81. https://doi.org/10.1007/s00268-017-4147-8
14. Kumar V, Pande GK. Complications of cholecystectomy in the era of laparoscopic surgery. Trop Gastroenterol. 2001;22:72-9.
15. Pujahari AK. Day care vs overnight stay after laparoscopic cholecystectomy even with co-morbidity and a possible second surgery: A patient's choice. J Clin Diagn Res. 2016;10:25-7. https://doi.org/10.7860/JCDR/2016/22363.8673
16. Bal S, Reddy LGS, Parshad R, Guleria R, Kashyap L. Feasibility and safety of day care laparoscopic cholecystectomy in a developing country. Postgrad Med J. 2003;79:284-8. https://doi.org/10.1136/pmj.79.931.284
17. Sharpe JP, Weinberg JA, Magnotti LJ, Nouer SS, Yoo W, Zarzaur BL, et al. Outcomes of operations performed by attending surgeons after overnight trauma shifts. J Am Coll Surg. 2013;216;791-9. https://doi.org/10.1016/j.jamcollsurg.2012.12.005
18. Portinari M, Scagliarini M, Valpiani G, Bianconcini S, Andreotti D, Stano R, et al. Do I need to operate on that in the middle of the night? Development of nomogram for the diagnosis of severe acute cholecystitis. J Gastrointest Surg. 2018;22:1016-25. https://doi.org/10.1007/s11605-018-3708-y
19. Sierra S, Zapata F, Méndez M, Portillo S, Restrepo C. Colecistectomía subtotal: Una alternativa en el manejo de la colecistectomía difícil. Rev Colomb Cir. 2020;35:593-600. https://doi.org/10.30944/20117582.565