POSTOPERATIVE COMPLICATION RATES IN PATIENTS UNDERGOING URGENT AND ELECTIVE VIDEOLAPAROSCOPIC CHOLECYSTECTOMY

FRANCIELY DOS PASSOS PEREIRA[1], WIULLER OLIVEIRA SILVERIO[1], VITOR RIBEIRO NOVAES[1], GIOVANA TUCCILLE COMES BRAMBILLA[1], VIRGÍLIO CARDOSO MORENO[1], ERIKA VERUSKA PAIVA ORTOLAN[1]

1. Hospital Centro-Norte Goiano, Departamento de Cirurgia Geral, Uruaçu/GO, Brazil

ABSTRACT

This study analyzed the epidemiological profile and postoperative complications of patients undergoing urgent and elective laparoscopic cholecystectomy at a tertiary public hospital in the Central-Northern region of Goiás. This was a cross-sectional, analytical, and comparative study, with retrospective data collection from medical records of patients aged ≥18 years who underwent surgery between 2023 and 2024. The variables evaluated included demographic characteristics, operative time, self-limited intraoperative bleeding, complications, length of hospital stay, need for ICU admission, and mortality.

A total of 524 patients were included, with a predominance of females (79.8%) and a mean age of 50.8 ± 15.3 years. The overall complication rate was low (1.7%), but higher in the urgent group (3.9%) compared to the elective group (1.3%). Operative time was significantly longer in urgent procedures, exceeding 45 minutes in 93.4% of cases, compared to 78.3% in elective surgeries (p < 0.01).

In the multivariate analysis, urgent surgery (OR = 7.98; p = 0.014), ICU admission (OR = 6.03; p < 0.001), and self-limited intraoperative bleeding (OR = 5.28; p < 0.001) were independently associated with complications. Prolonged hospital stay (≥3 days) was associated with urgent surgery, ICU admission, operative time >45 minutes, male sex, and complications.

In conclusion, laparoscopic cholecystectomy showed a low complication rate. Urgent procedures, intensive care, and self-limited intraoperative bleeding represent markers of greater clinical and technical complexity and are associated with a higher risk of adverse events. These factors, together with male sex and prolonged operative time, were also associated with longer hospital stays.

Keywords: Cholelithiasis, Laparoscopic cholecystectomy, Postoperative complications, Emergency surgery, Elective surgery, Morbidity.

INTRODUCTION

Cholelithiasis is a highly prevalent disease. It is estimated that approximately 10–15% of the North American population is affected by the disease. A Brazilian necropsy

study reported that between 9% and 20% of the population older than 20 years of age is diagnosed with cholelithiasis.[1]

Most individuals with cholelithiasis do not present symptoms, and it is expected that 20% of these patients will develop typical symptoms during their lifetime, while 1–2% progress with some complication of the disease each year.[2]

Cholecystectomies can be categorized as elective or urgent, where elective surgeries are those in which it is possible to choose the most appropriate date for the surgical procedure, whereas urgent and emergency procedures cannot wait and must be performed during the same hospitalization. Elective surgeries are predominantly performed after examinations that confirm the patient has achieved the best possible health condition, minimizing as much as possible the risk of complications. Meanwhile, urgent and emergency surgeries are carried out when the patient presents with a severe condition, such as acute cholecystitis, making immediate intervention necessary.[3]

Historically, open surgery was the standard method for cholecystectomy. However, due to advances in minimally invasive techniques, laparoscopy emerged as a widely chosen option because of its clinical, aesthetic, and functional benefits, such as shorter hospitalization time, reduced postoperative pain, and faster recovery.[4,5,6]

In contrast, open cholecystectomy is generally reserved for more complex cases, such as severe acute cholecystitis, gallbladder perforation, or when the laparoscopic approach is not possible. This technique involves a larger incision in the abdominal wall in order to allow direct access to the gallbladder and the biliary ducts.[7]

Although laparoscopic cholecystectomy is a well-established and safe surgical approach, complications have been described in both elective and urgent procedures, such as bleeding from the hepatic bed, diffuse and intense abdominal pain, hypotension, urinary retention, post-extubation bronchospasm, hemodynamic instability, acute renal failure, central cyanosis, and necrosis of the extremities.[8]

JUSTIFICATION

The study on this topic is justified because, by critically analyzing patients undergoing urgent or elective cholecystectomy, it is expected to provide valuable insights for surgeons as well as for healthcare professionals involved in the management of cholelithiasis, helping them to make informed decisions and optimize patient care.

In this context, it is evident that postoperative complications of cholecystectomy, although infrequent, require careful attention from the surgical team, since they may compromise the patient's recovery and require additional interventions. Furthermore, they may present clinical implications in the medium and long term, supporting the need for careful follow-up of these patients, even after a successful surgical procedure.

OBJECTIVES
General objetive

The present study aims to analyze the epidemiological profile of patients undergoing emergency and elective laparoscopic cholecystectomies, treated in the General Surgery Department of a tertiary public hospital in the Central-North region of Goiás, between 2023 and 2024.

Specific objetives

• To compare postoperative complications associated with elective and emergency laparoscopic cholecystectomies;

• To compare clinical and demographic data, surgical time, and conversion rates to open surgery between patients undergoing elective and emergency cholecystectomy;

• To compare the results with data reported in the literature.

METHODOLOGY

This was a cross-sectional cohort, analytical and comparative study, with retrospective data collection through medical record review, in which patients who underwent laparoscopic cholecystectomy between January 2023 and December 2024 at a tertiary public hospital in the Central-North region of Goiás were evaluated. Data collected included identification variables (age and sex), duration of the procedure, occurrence of self-limited intraoperative bleeding, postoperative complications (Figure 1), conversion to open surgery, need for hemotransfusion, need for hematimetric monitoring, length of hospital stay, admission to the intensive care unit (ICU) (in days), and deaths.

For the purposes of analysis, the term "bleeding" was considered a self-limited intraoperative event identified in the medical record, resolved with local hemostasis during the surgical procedure, without hemodynamic instability, without the need for hemotransfusion, and without clinical repercussions in the immediate postoperative period; therefore, it was not classified as a complication. "Intra-abdominal hemorrhage," in turn, was defined as an early complication characterized by bleeding with clinical repercussions and/or the need for reintervention, according to the criteria described in the list of complications of the study (Figure 1).

Patients older than 18 years, treated in the General Surgery Unit of the Hospital Estadual do Centro-Norte Goiano between 2023 and 2024, who underwent elective or emergency laparoscopic cholecystectomy, were included. Medical records with insufficient or incomplete information were excluded from the study.

Statistical analysis was conducted using the Statistical Package for the Social Sciences (SPSS), version 26.0 (IBM Corporation, Armonk, NY, USA). The significance level adopted was 5% ($\alpha = 0.05$) with two-tailed tests. Initially, the sample was described using descriptive statistics. Continuous variables were presented as mean ± standard deviation (SD), and categorical variables as absolute frequency (n) and relative frequency (%). Comparisons between the elective surgery and emergency surgery groups were performed using the Pearson chi-square test for categorical variables and the Student's t-test for independent samples for continuous variables.

To investigate factors associated with the study outcomes, binary logistic regression models were fitted considering the following dependent variables: presence of complications (yes/no) and length of hospital stay (≤ 2 days vs. ≥ 3 days). The independent variables included in the models were: age group (< 50 years vs. ≥ 50 years), sex (female/male), type of surgery (elective/emergency), ICU admission (yes/no), surgical procedure time (≤ 45 min vs. > 45 min), and occurrence of bleeding (yes/no). Results were expressed as odds ratios (OR) with their respective 95% confidence intervals (95% CI). For the complications model, Firth's penalized logistic regression was used due to the presence of complete or quasi-complete separation in some categories, in order to reduce bias and allow stable estimates of OR and 95% CI.

Figure 2. (A) Patient positioning for pre-oxygenation. (B) Video laryngoscopy.

The research was conducted in accordance with the Guidelines and Regulatory Standards for Research Involving Human Subjects (Resolution 466/2012 of the Brazilian National Health Council), ensuring confidentiality, privacy, protection of image, and non-stigmatization of the participants, guaranteeing that the information would not be used to the detriment of the individuals involved, including aspects related to self-esteem, prestige, and/or economic and financial issues. No photographic records or filming of questionnaires or identification forms were performed. The study was approved by the Research Ethics Committee for Human Subjects under CAAE: 92301025.2.0000.5082.

RESULTS

During the study period, 448 elective surgeries and 76 emergency surgeries were performed. Table 1 presents the characterization of the demographic profile of patients who underwent surgical procedures, totaling 524 individuals. The sample showed a mean age of 50.82 ± 15.30 years, with no statistically significant difference between the groups (51.21 ± 15.17 in elective procedures vs. 48.53 ± 15.92 in emergency procedures; $p = 0.17$, Student's t-test).

Regarding age distribution by groups, a predominance of individuals between 40 and 59 years old was observed (43.3% of the total), followed by the groups 18 to 39 years (26.3%) and 60 to 69 years (17.9%). Individuals 70 years or older accounted for 12.4% of the sample. The distribution of age groups did not differ between elective and emergency surgeries ($p = 0.34$, chi-square test), although a numerically higher proportion of patients 18 to 39 years old was observed in the emergency group (32.9%) compared with the elective group (25.2%).

Regarding sex, there was a predominance of female patients in the cohort (79.8%), with a similar distribution between groups (80.6% in elective surgeries vs. 75.0% in emergency surgeries; $p = 0.33$, chi-square test). Male patients represented 20.2% of the total sample, with a numerically higher proportion in emergency surgeries (25.0%) compared with elective surgeries (19.4%), without statistical significance.

Figure 1. Demographic profile of patients undergoing elective and emergency surgery (n = 524).

Type of Surgery	Total p	Elective	Emergency
Age group n (%)			
18 to 39 years	138 (26.3)	113 (25.2)	25 (32.9)
40 to 59 years	227 (43.3)	197 (44.0)	30 (39.5)
60 to 69 years	94 (17.9)	79 (17.6)	15 (19.7)
70 or more	65 (12.4)	59 (13.2)	6 (7.9)
Mean ± SD	50.82 ± 15.30	51.21 ± 15.17	48.53 ± 15.92
Sex n (%)			
Female	418 (79.8)	361 (80.6)	57 (75.0)
Male	106 (20.2)	87 (19.4)	19 (25.0)

*Chi-square test; **Student's t-test; n, absolute frequency; %, relative frequency; SD, standard deviation.

In the total sample of 524 patients, the overall occurrence of complications was low (9 cases; 1.7%) (Table 2). A tendency toward a higher frequency of complications was observed in the emergency group (3.9%) compared with the elective group (1.3%), although without statistically significant difference (p = 0.25, chi-square test). Similarly, early complications occurred in 6 patients (1.1%), with nearly identical proportions between elective surgeries (1.1%) and emergency surgeries (1.3%; p = 1.00). Meanwhile, late complications were rare (0.4% overall), also showing no difference between the groups (0.2% in elective procedures vs. 1.3% in emergency procedures; p = 0.67) (Table 2).

Regarding the need for intensive care, 22 patients (4.2%) required ICU admission, with a similar distribution between elective surgeries (4.5%) and emergency surgeries (2.6%; p = 0.67). Among patients admitted to the ICU, 100% remained for ≥ 3 days in both groups, with no records of ICU stays lasting 1 to 2 days (Table 2). All ICU admissions were due to preexisting comorbidities (20 patients) or anesthetic complications (2 patients).

When analyzing length of hospital stay, marked differences were observed according to the type of surgery. Most patients in the elective group had a hospital stay ≤ 2 days (89.7%), whereas in the emergency group there was a predominance of hospital stays ≥ 3 days (93.4%), showing a statistically significant association (p < 0.01, chi-square test). Consistently, the mean length of hospital stay was significantly longer in emergency surgeries (7.39 ± 4.49 days) compared with elective surgeries (2.32 ± 3.47 days), with an overall mean of 3.06 ± 4.05 days (p < 0.01, Student's t-test) (Table 2).

Figure 2. Clinical care characteristics of patients undergoing elective and emergency surgery (n = 524).

Variable	Elective (n=448)	Emergency (n=76)	Total (n=524)	p
Complications n (%)				
Global	6 (1.3)	3 (3.9)	9 (1.7)	0.25*
Early	5 (1.1)	1 (1.3)	6 (1.1)	1.00*
Late	1 (0.2)	2 (2.6)	3 (0.4)	0.67*
ICU admission n n (%)				
Yes	20 (4.5)	2 (2.6)	22 (4.2)	0.67*
No	428 (95.5)	74 (97.4)	502 (95.8)	
Length of hospital stay n (%)				
≤ 2 days	402 (89.7)	5 (6.6)	407 (77.7)	<0.01*
≥ 3 days	46 (10.3)	71 (93.4)	117 (22.3)	
Mean ± SD (days)	2.32 ± 3.47	7.39 ± 4.49	3,06 ± 4.05	<0.01**

*Chi-square test; **Student's t-test; n, absolute frequency; %, relative frequency; SD, standard deviation.

Table 3 presents the data related to the surgical care of patients undergoing elective and emergency surgery. In the evaluation of intraoperative events, the occurrence of complications was very low. Bleeding was observed in 2 patients (0.4%), both in the elective surgery group (0.4% vs. 0.0% in the emergency group; p = 1.00, chi-square test). Similarly, the need for local hemostasis was also recorded in 2 cases (0.4%), likewise restricted to the elective group (p = 1.00). The use of packed red blood cells was a rare event (1 patient; 0.2%) and occurred only in the emergency group (1.3% vs. 0.0% in elective procedures), with no evidence of statistical association (p = 0.31).

Regarding procedure duration, a significant difference was observed between the groups. Considering the 45-minute cutoff point, 93.4% of emergency surgeries had a duration > 45 minutes, whereas in the elective group this proportion was 78.3% (p < 0.01, chi-square test). Consistently, the mean procedure time was significantly longer in emergency surgeries (80.42 ± 31.36 min) compared with elective surgeries (65.33 ± 27.06 min), with an overall mean of 67.52 ± 28.20 min (p < 0.01, Student's t-test).

Figure 3. Surgical care characteristics of patients undergoing elective and emergency surgery (n = 524).

Variable	Eletctive (n=448)	Emergency (n=76)	Total (n=524)	p
Self-limited intraoperative bleeding, n (%)	2 (0.4)	0 (0.0)	2 (0.4)	1.00*
Use of packed red blood cells, n (%)	0 (0.0)	1 (1.3)	1 (0.2)	0.31*
Local hemostasis, n (%)	2 (0.4)	0 (0.0)	2 (0.4)	1.00*
Fundus-first cholecystectomy, n (%)	0 (0.0)	0 (0.0)	0 (0.0)	1.00*
Conversion to open surgery, n (%)	0 (0.0)	0 (0.0)	0 (0.0)	1.00*
Hemotransfusion, n (%)	0 (0.0)	0 (0.0)	0 (0.0)	1.00*
Hematimetric monitoring, n (%)	0 (0.0)	0 (0.0)	0 (0.0)	1.00*
Procedure time, n (%)				
≤ 45 min	97 (21.7)	5 (6.6)	102 (19.5)	<0.01*
> 45 min	351 (78.3)	71 (93.4)	422 (80.5)	
Mean ± SD (min)	65.33 ± 27.06	80.42 ± 31.36	67.52 ± 28.20	<0.01**

*Chi-square test; **Student's t-test; n, absolute frequency; %, relative frequency; SD, standard deviation; NA, not applicable.

Figure 1 presents the results of the logistic regression analysis of the variables. In the total sample (n = 524), 9 complications (1.7%) were observed. In the multivariable analysis using Firth's penalized logistic regression (to address complete separation), relevant associations between complications and clinical/perioperative variables were identified, as follows:

1. Age group: Patients aged ≥ 50 years accounted for the largest proportion of complications (66.7% of cases), whereas those aged < 50 years represented 33.3%. However, there was no statistically significant association between age and complications (OR = 1.45; 95% CI 0.68–4.89; $p = 0.363$), suggesting no robust evidence of increased risk at the adopted cutoff point.

2. Sex: A higher proportion of male patients was observed among cases with complications (44.4%) compared with their proportion among individuals without complications (19.8%). Nevertheless, the association did not reach statistical significance (OR = 3.25; 95% CI 0.70–15.14; $p = 0.134$), indicating a tendency toward higher risk among males, although with wide imprecision (broad 95% CI).

3. Type of surgery: A significant association was observed between emergency surgery and the occurrence of complications. Among patients who developed complications, 33.3% underwent emergency surgery, whereas among those without complications this proportion was 14.2%. In terms of magnitude, emergency surgery was associated with an approximately eightfold higher risk of complications compared with elective procedures (OR = 7.98; 95% CI 1.52–14.97; $p = 0.014$), indicating a clinically meaningful and statistically consistent effect.

4. ICU admission: The need for ICU admission showed a strong association with the occurrence of complications: among patients with complications, 44.4% required ICU admission, compared with only 3.5% among those without complications. This finding translated into a substantial increase in risk, with patients admitted to the ICU presenting 6.03 times higher odds of complications (OR = 6.03; 95% CI 3.93–9.73; $p < 0.001$). This factor showed one of the most robust associations, both in magnitude and statistical significance.

5. Procedure time: All complications occurred in procedures lasting > 45 minutes (100.0%), whereas no complications occurred in procedures ≤ 45 minutes (0.0%), reflecting a pattern of risk concentrated in longer procedures. However, in the penalized model the estimate did not show a statistically significant association (OR = 3.46; 95% CI 0.15–9.53; $p = 0.437$), consistent with high uncertainty due to the low frequency of the outcome and the absence of events in the shorter-duration stratum.

6. Self-limited intraoperative bleeding: The variable self-limited intraoperative bleeding showed a significant association with the occurrence of postoperative complications. Among patients who developed complications, 22.2% experienced intraoperative bleeding, whereas in the group without complications this proportion was 0.0%, indicating a higher frequency of this technical event among cases with adverse outcomes. In Firth's penalized logistic regression, the presence of self-limited intraoperative bleeding was associated with a 5.28-fold increase in the odds of complications (OR = 5.28; 95% CI 2.33–9.90; $p < 0.001$), suggesting that intraoperative bleeding episodes, even when controlled, represent a marker of greater surgical complexity and risk of postoperative events.

Overall, the results indicate that in this cohort emergency surgery, ICU admission, and bleeding showed the most consistent associations with complications (large effect sizes and $p < 0.05$), whereas age, sex, and procedure time did not demonstrate statistically significant

associations in the adjusted model.

In the cohort (n = 524), 407 patients (77.7%) had a hospital stay ≤ 2 days, while 117 (22.3%) had a length of stay ≥ 3 days. In the multivariable logistic regression analysis (Figure 2), clinical and care-related determinants strongly associated with prolonged hospitalization were identified as follows:

1. Age group: Patients aged ≥ 50 years represented 55.6% of the group with prolonged hospitalization (≥ 3 days), compared with 50.6% in the group with stays ≤ 2 days. Despite this higher representation in the longer-stay group, no statistically significant association was observed between age and prolonged hospitalization (OR = 1.22; 95% CI 0.81–1.84; p = 0.346).

2. Sex: A higher proportion of male patients was observed among those with hospitalization ≥ 3 days (27.4%) compared with those with stays ≤ 2 days (18.2%). Male sex was significantly associated with higher odds of prolonged hospitalization (OR = 1.69; 95% CI 1.05–2.73; p = 0.031), indicating approximately a 69% greater likelihood of remaining hospitalized for ≥ 3 days compared with females.

3. ICU admission: ICU admission showed one of the strongest associations: only 0.7% of patients with stays ≤ 2 days were admitted to the ICU, whereas in the ≥ 3 days group this proportion was 16.2%. This pattern translated into a marked increase in risk, with patients requiring ICU admission having 6.11 times higher odds of hospitalization ≥ 3 days (OR = 6.11; 95% CI 3.57–9.00; p < 0.001).

4. Procedure time: Procedures lasting > 45 minutes were more frequent among prolonged hospitalizations (88.9%) than among hospitalizations ≤ 2 days (78.1%). Duration > 45 minutes was significantly associated with prolonged stay (OR = 2.24; 95% CI 1.20–4.17; p = 0.011), suggesting more than twice the odds of hospitalization ≥ 3 days compared with procedures ≤ 45 minutes.

5. Type of surgery: The variable with the greatest proportional contrast was type of surgery: among patients with hospitalization ≤ 2 days, 98.8% underwent elective surgery, whereas in the ≥ 3 days group 60.7% underwent emergency surgery (vs 1.2% in the ≤ 2 days group). This pattern was supported by a highly significant association, with emergency surgery associated with a 4.10-fold higher likelihood of prolonged hospitalization (OR = 4.10; 95% CI 2.67–7.07; p < 0.001).

6. Presence of complications: The occurrence of complications was substantially more frequent in the ≥ 3 days group (6.0%) than in the ≤ 2 days group (0.5%). The presence of complications was associated with 8.89 times higher odds of prolonged hospitalization (OR = 8.89; 95% CI 2.64–12.91; p = 0.002), indicating that adverse events in the perioperative period are a key determinant of longer hospital stay.

In summary, male sex, ICU admission, procedure time > 45 minutes, emergency surgery, and the presence of complications were factors significantly associated with a higher likelihood of hospital stay ≥ 3 days, with particular emphasis on the impact of complications and ICU admission (largest effect sizes). Age was not significantly associated with prolonged hospitalization in the adjusted model.

DISCUSSION

Based on the proposed methodology, a survey of the epidemiological characteristics of patients undergoing emergency and elective laparoscopic cholecystectomy was conducted. Medical records of 524 patients followed at a tertiary public hospital in the Central-North region of Goiás were analyzed. It was observed that the majority of patients in the present study

were female (79.8%), with a similar distribution between groups (80.6% in elective surgeries vs. 75.0% in emergency surgeries; p = 0.33, chi-square test).

Corroborating these findings, in the study by Felicio et al. (2017)[9], among a population of 86,519 patients, 82.8% (71,652) were women, with a predominance in the 45–54-year age group (22.4%). Mesquita & Iglesias (2018)[10] also reported that among 345 patients undergoing laparoscopic cholecystectomy, 80% were female.

Regarding age group, a predominance was observed between 40 and 59 years (43.3% of the total), followed by 18 to 39 years (26.3%) and 60 to 69 years (17.9%). Individuals 70 years or older represented 12.4% of the sample. Moss et al. (2025)[11] corroborate the findings of the present study, reporting a mean patient age of 49 years. In contrast, Mesquita & Iglesias (2018)[10] found that most patients were concentrated in the 60–69-year age group (62%). Thus, it is considered that elderly patients present a more exacerbated response to the surgical trauma of laparoscopic cholecystectomy, with an inflammatory response that persists for a longer period.[12]

Regarding clinical complications associated with the surgical procedure, the present study showed that the overall occurrence of complications was low, with a tendency toward a higher frequency of complications in the emergency group (3.9%) compared with the elective group (1.3%), although without statistically significant difference (p = 0.25, chi-square test). In addition, only 22 patients (4.2%) required ICU admission, with a similar distribution between elective (4.5%) and emergency surgeries (2.6%; p = 0.67). Among patients admitted to the ICU, 100% remained for ≥ 3 days in both groups, with no records of ICU stays lasting 1 to 2 days. Similarly, in the study by Felicio et al. (2017)[9], the authors found that 760 patients (0.0087%) required ICU admission.

Data from the present study also corroborate Felicio et al. (2017) [9], showing that patients undergoing emergency surgery had a longer mean length of hospital stay (7.39 ± 4.49 days) compared with those undergoing elective surgery (2.32 ± 3.47 days). For the authors, the mean length of hospital stay differed from that observed in the group undergoing elective laparoscopic cholecystectomy, which was 2.32 days.

This difference was also evidenced in the categorical analysis: 93.4% of patients in the emergency surgery group remained hospitalized for 3 days or more, whereas the majority of patients in the elective surgery group (89.7%) were discharged within 2 days (p < 0.01).

Findings in the literature indicate that emergency surgery is associated with a higher probability of developing postoperative complications and with longer hospital stays. Emergency surgery has been independently associated with higher complication rates and increased length of hospitalization.[13]

CONCLUSION

In the present sample, a low rate of complications was observed in laparoscopic cholecystectomies. Emergency surgery and the need for admission to the intensive care unit were the main factors independently associated with the occurrence of postoperative complications. In addition, the presence of self-limited intraoperative bleeding was associated with a higher risk of adverse outcomes, constituting a marker of greater technical complexity of the procedure.

Regarding length of hospital stay, emergency surgery, the need for intensive care, prolonged operative time, and male sex were associated with longer hospitalization, reflecting greater clinical severity and perioperative complexity in these patients.

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MAILING ADDRESS

VITOR RIBEIRO NOVAES

Rua 70 numero 140 apto 802, Bairro Jardim Goiás, Goiânia/GO, Brasil.

E-mail: dr.vrnovaes@gmail.com