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Prevalence and Outcomes of Laparoscopic Appendectomy: Ten Years of Experience in Yaounde

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Abstract

Background : Laparoscopic appendectomy (LA) is the standard treatment for acute appendicitis in high-income countries, but its diffusion in low- and middle-income countries remains limited. Data from Cameroon are scarce. **Objective**: To assess the prevalence, indications, and outcomes of laparoscopic appendectomy in Yaounde. **Methods**: We conducted a retrospective multicenter study in four referral hospitals in Yaounde from January 2015 to December 2024. Records of all patients who underwent laparoscopic appendectomy were reviewed. **Results**: Among 478 appendectomies, 236 (49.4%) were laparoscopic. Uncomplicated appendicitis was the main indication (80.1%). The conversion rate was 4.7%. Postoperative complications occurred in 7.2%, mainly surgical site infection. Mean hospital stay was 3.4 ± 2 days. No mortality occurred. Prolonged operative time was significantly associated with conversion ($p = 0.001$). **Conclusion**: Laparoscopic appendectomy represents nearly half of appendectomies in major hospitals in Yaounde and shows favorable outcomes. Wider adoption should be encouraged.

Keywords

Laparoscopic Appendectomy, Prevalence, Conversion, Surgical Outcomes, Cameroon

1. Introduction

Acute appendicitis is one of the most frequent surgical emergencies worldwide

and remains a major cause of emergency abdominal surgery [1]. Since McBurney described open appendectomy in 1889, this procedure has long been the standard treatment [2]. The introduction of laparoscopic surgery by Semm in 1983 marked a turning point in the surgical management of appendicitis [3].

In high-income countries, laparoscopic appendectomy has progressively become the preferred approach for both uncomplicated and complicated appendicitis, owing to reduced postoperative pain, shorter hospital stay, faster recovery, and better cosmetic outcomes [4]-[6]. International guidelines, including those of the World Society of Emergency Surgery (WSES), now recommend laparoscopy whenever expertise and equipment are available [7].

In low- and middle-income countries (LMICs), however, the diffusion of laparoscopy has been slower because of limited access to equipment, high costs, lack of trained surgeons, and organizational constraints [8] [9]. In sub-Saharan Africa, open appendectomy still predominates in many centers, with reported laparoscopic rates often below 20% [10] [11].

In Cameroon, laparoscopic surgery was introduced in the early 1990s at the Yaounde General Hospital [12], but national data on the practice of laparoscopic appendectomy remain limited. Understanding the prevalence, indications, and outcomes of this technique is essential to guide training policies and resource allocation. The present study aimed to assess the prevalence and outcomes of laparoscopic appendectomy over a ten-year period in four major hospitals in Yaounde.

2. Methods

We conducted a multicenter retrospective observational study in four hospitals in Yaounde: University Teaching Hospital of Yaounde, National Social Insurance Fund Hospital of Essos, Jordan Medical Services, and Marie Wyss Hospital.

The study covered the period from January 2015 to December 2024. The study population included all patients aged ≥ 15 years who underwent appendectomy during the study period in the participating hospitals. Cases were identified through operating theatre registers, surgical logbooks, and hospital medical records, ensuring consistent case ascertainment across the four sites. Patients who underwent laparoscopic appendectomy constituted the study group. Patients with incomplete records regarding key variables (age, sex, indication, or outcomes) were excluded.

Data were extracted from operative registers and medical records using a standardized data collection form. Variables included age, sex, comorbidities, indication for surgery, American Society of Anesthesiologists (ASA) class, operative time, conversion to open surgery, postoperative complications, duration of hospital stay, time to oral feeding, and mortality.

The primary outcome was the prevalence of laparoscopic appendectomy among all appendectomies performed during the study period. Secondary outcomes included indications for surgery, conversion rate, operative time, postop-

erative complications, and length of hospital stay.

Postoperative complications were assessed from the immediate postoperative period until hospital discharge, and classified according to the Clavien-Dindo classification.

Surgical site infection (SSI) was defined according to Centers for Disease Control and Prevention (CDC) criteria, including superficial or deep incisional infection occurring at the surgical site with purulent discharge or clinical signs requiring treatment.

Conversion was defined as any unplanned change from laparoscopic appendectomy to open appendectomy requiring an abdominal incision [13].

Conversion rate, length of hospital stay, and factors associated with conversion and complications. To explore factors associated with conversion and postoperative complications, bivariate analyses were performed using chi-square or Fisher's exact tests for categorical variables and Student's t-test for continuous variables. Because of the limited number of events, no multivariable regression model was performed, and therefore associations should be interpreted cautiously.

Data were analyzed using Epi-Info version 3.4.1 and R software version 4.2.2. Categorical variables were expressed as frequencies and percentages, and continuous variables as means ± standard deviation. Associations were assessed using chi-square or Fisher's exact test for categorical variables and Student's t-test for continuous variables. A p-value < 0.05 was considered statistically significant.

3. Results

Prevalence

During the study period, 236 laparoscopic appendectomies were performed, representing 49.4% of all appendectomies in the four hospitals. The percentage of laparoscopic appendectomies increased progressively from 2015 until 2024 as shown in **Figure 1**.

The mean age was 33 ± 15 years, with male predominance (sex ratio = 1:1.05). Regarding the ASA classification, 80.08% (ASA 1), 17.79% (ASA 2) with minimal morbidity as shown in **Table 1**. General anesthesia was used in 97.9% (n = 231), while 2.1% (n = 5) underwent spinal anesthesia

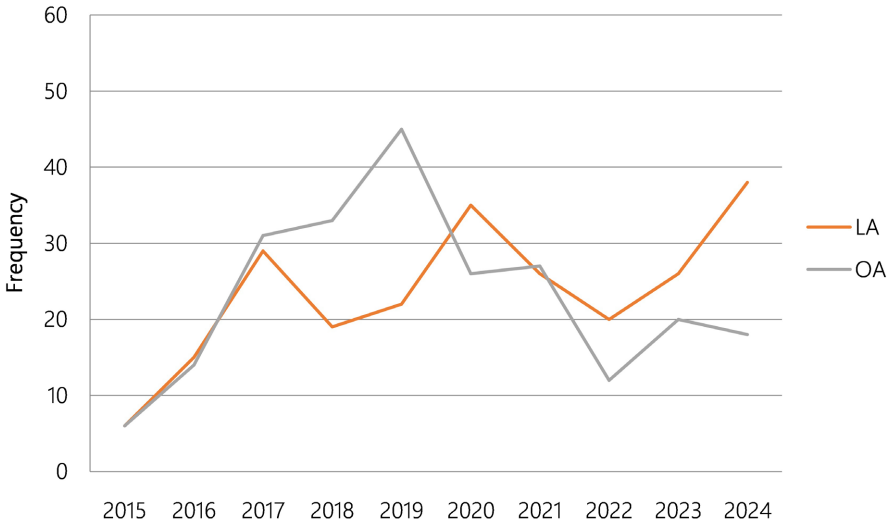
Uncomplicated appendicitis was the most frequent indication (80.1%), followed by appendiceal abscess (12.3%), appendiceal peritonitis (5.5%), chronic appendicitis (2.1%) as shown in **Table 1**.

The mean operative time was 78 ± 12 minutes. Conversion to open surgery occurred in 4.7% of cases, mainly due to generalized peritonitis and difficult dissection as shown in **Table 2**. Operative time ≥ 120 minutes was significantly associated with conversion to open surgery ($p = 0.001$). Advanced disease stage and generalized peritonitis were also frequent contributing factors as shown in **Table 3**.

Postoperative complications occurred in 7.2% of patients, predominantly sur-

gical site infections, and most of the complications were managed medically as shown in Table 4. Most complications were Clavien-Dindo grade I or II as shown in Table 5. No postoperative mortality was recorded. The mean hospital stay was 3.4 ± 2 days. Oral feeding was resumed within 24 - 48 hours in most patients.

In bivariate analysis, no variable showed a statistically significant association with postoperative complications as shown in Table 6.



Note: Line graph showing progressive increase of laparoscopic appendectomy over time.

Figure 1. Trends of laparoscopic and open appendectomy from 2015 to 2024.

Table 1. Indications of LA.

Indications	Frequency (n = 236)	Percentage %
Uncomplicated appendicitis	189	80.1
Appendiceal abscess	29	12.3
Appendiceal peritonitis	13	5.51
Chronic appendicitis	5	2.11
Total	47	19.90%

Table 2. Reasons for Conversion from Laparoscopic appendectomy to open and surgical approach.

Reasons for conversions	Frequency (n = 11)	Percentage %
Wide spread peritonitis	7	63.6
Missed diagnosis	4	36.4
Approach of conversion		
Mc Burney approach	7	63.6
Midline Approach	4	36.4
Total	11	100

Table 3. Factors associated with conversion to open surgery.

Variable	Category	Conversion Yes n (%)	Conversion No n (%)	Total	p-value
Age > 40	No	6 (3.6)	160 (96.4)	166	0.24
Age > 40	Yes	5 (7.1)	65 (92.9)	70	
Obesity	No	0 (0)	13 (100)	13	0.101
Obesity	Yes	1 (9.5)	7 (90.5)	8	
Complicated appendicitis	Abscess	4 (13.3)	26 (86.7)	30	0.145
Complicated appendicitis	Peritonitis	5 (31.3)	12 (68.7)	17	
Operative time	<120 min	0 (0)	128 (100)	128	<0.001
Operative time	≥120 min	11 (10.2)	97 (89.8)	108	

Table 4. Patients having complications, the type and means of management.

Type of complication	Frequency (n = 17)	Percentage %	Management type	Medical n (%)	Surgical n (%)	Laparoscopy n (%)
SSI	7	41.2	medical	7 (100)	0	0
Bleeding	2	11.8	surgical	0	2 (100)	2 (100)
Ileus	1	5.76	surgical	0	1 (100)	1 (100)
Fever	2	11.8	medical	2 (100)	0	0
Hypertension crises	2	11.8	medical	1 (100)	0	0
Vomiting	2	11.8	medical	2 (100)	0	0
Infectious Gastroenteritis	1	5.76	medical	1 (100)	0	0

Note: *SSI = surgical site infection.

Table 5. Postoperative complications according to Clavien-Dindo classification.

Clavien dindo grading	Frequency (n = 17)	Percentage %
Grade 1	3	17.64
Grade2	10	58.83
Grade3	4	23.53
Grade4	0	0
Grade 5	0	0

Table 6. Factors associated with postoperative complications.

Variable	Category	Complication Yes n (%)	Complication No n (%)	Total	p-value
Age > 40	No	12 (7.2)	154 (92.8)	166	0.981
Age > 40	Yes	5 (7.1)	65 (92.9)	70	

Continued

Obesity	**No**	**3 (11.1)**	**24 (88.9)**	**27**	**0.858**
Obesity	Yes	2 (9.5)	19 (90.5)	21	
Complicated appendicitis	Abscess	4 (13.3)	26 (86.7)	30	0.936
Complicated appendicitis	Peritonitis	2 (12.5)	14 (87.5)	16	
Operative time	<120 min	6 (4.7)	122 (95.3)	128	0.104
Operative time	≥120 min	11 (10.2)	97 (89.8)	108	
Conversion	No	15 (6.7)	210 (93.3)	225	0.149
Conversion	Yes	2 (18.2)	9 (81.8)	11	

Table 7. Population according to ASA classification.

ASA classification	Frequency (n = 236)	Percentage %
ASA 1	189	80.08
ASA 2	42	17.79
ASA 3	4	1.7
ASA 4	1	0.4

4. Discussion

This study represents one of the largest published series of laparoscopic appendectomy in Cameroon. We found that nearly half of all appendectomies were performed laparoscopically, reflecting a substantial diffusion of minimally invasive surgery in major urban hospitals.

4.1. Prevalence of Laparoscopic Appendectomy

The prevalence of 49.4% observed in our study is higher than earlier reports from sub-Saharan Africa, where laparoscopic rates often ranged between 10% and 25% [10] [11] [14]. In Nigeria, Olasehinde *et al.* Reported a prevalence of approximately 15% [15], while Lavy and Mulwafu found rates below 20% in most urban centers [10]. Our findings suggest a rapid and recent adoption of laparoscopy in Yaounde, likely driven by improved availability of equipment, growing surgeon expertise, and patient demand.

In high-income countries, laparoscopic appendectomy now represents more than 80% of procedures [4] [5]. Although our rate remains lower, the observed trend toward progressive increase over time indicates a convergence toward international standards.

4.2. Indications

Uncomplicated appendicitis was the main indication in our series, in agreement with most published studies [6] [7] [16]. The proportion of complicated appendi-

citis, particularly appendiceal abscess and generalized peritonitis, remains significant and reflects delayed presentation and diagnostic challenges in LMICs [9] [17].

Current WSES guidelines recommend laparoscopy even in complicated appendicitis when expertise is available [7]. Our results confirm the feasibility of this approach, with acceptable conversion and complication rates.

4.3. Conversion Rate

The conversion rate of 4.7% in our study is comparable to rates reported in large international series, which range between 2% and 8% [6] [18]. The main reasons for conversion were generalized peritonitis and difficult dissection, consistent with previous reports [18] [19].

We found that prolonged operative time was associated with conversion to open surgery. This relationship may reflect greater technical difficulty or advanced disease stage rather than a strictly causal effect, a finding also reported by several authors [19] [20]. This association likely reflects technical difficulty and advanced disease stage. Identifying patients at high risk of conversion may help optimize surgical planning and resource utilization.

4.4. Postoperative Complications and Mortality

The overall complication rate of 7.2% is within the range reported in both African and international studies [6] [15] [21]. Surgical site infection was the most frequent complication, as commonly described in LMIC settings [9] [21]. Importantly, no postoperative mortality was recorded, confirming the safety of laparoscopic appendectomy in experienced hands.

Most complications were minor (Clavien-Dindo I-II), requiring only conservative management. This low severity profile reinforces the benefit of minimally invasive surgery in reducing postoperative morbidity.

4.5. Length of Hospital Stay and Recovery

The mean hospital stay of 3.4 days and early resumption of oral feeding are consistent with international data showing shorter hospitalization after laparoscopic appendectomy compared with open surgery [4] [5] [22]. In resource-limited settings, reducing length of stay is particularly important to optimize bed turnover and reduce healthcare costs.

4.6. Implications for Practice in LMICs

Our findings support the progressive expansion of laparoscopic appendectomy in Cameroon and similar LMICs. Investment in training, maintenance of equipment, and development of standardized protocols is essential to sustain this progress. The good outcomes observed in this study demonstrate that high-quality minimally invasive surgery is achievable in resource-constrained environments.

Although laparoscopic appendectomy showed favorable outcomes in our se-

ries, this study did not include a direct comparative analysis with open appendectomy performed in the same hospitals. Therefore, conclusions regarding the superiority of laparoscopy over open surgery in this setting should be interpreted cautiously.

5. Limitations

This study has several limitations. Its retrospective design may have introduced information bias. Some variables, such as long-term outcomes and patient-reported quality of life, were not available. Finally, the study was limited to urban referral hospitals and may not reflect practices in rural settings.

Despite these limitations, the large sample size, multicenter design, and long study period strengthen the validity of our conclusions.

6. Conclusion

Laparoscopic appendectomy now represents nearly half of appendectomies in major hospitals in Yaounde and is associated with low morbidity, short hospital stay, and zero mortality. Prolonged operative time was associated with conversion to open surgery, likely reflecting increased operative complexity. These Results support the feasibility and safety of laparoscopic appendectomy in this setting and suggest that its wider adoption may be beneficial where expertise and equipment are available for appendicitis in Cameroon and similar LMIC settings.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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