

Pediatric Laparoscopic Surgery: Experience of Mother and Child Hospital of Bingerville

Koffi Koffi Maxime*, Tembely Samba, Menyé-Assamoi Marie, Zambi Audric-Aimé, Assi Assoman Bernabé, Pian Yann Yvan, Dieth Atafy Gaudens, da Silva-Anoma Sylvia

Mother and Child Hospital of Bingerville, University Felix Houphouet Boigny of Cocody, Abidjan, Côte d'Ivoire

Email: *koffimaxime@gmail.com

How to cite this paper: Maxime, K.K., Samba, T., Marie, M.-A., Audric-Aimé, Z., Bernabé, A.A., Yvan, P.Y., Gaudens, D.A. and Sylvia, da S.-A. (2025) Pediatric Laparoscopic Surgery: Experience of Mother and Child Hospital of Bingerville. *Open Journal of Pediatrics*, 15, 382-387.

<https://doi.org/10.4236/ojped.2025.153036>

Received: April 16, 2025

Accepted: May 23, 2025

Published: May 26, 2025

Copyright © 2025 by author(s) and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Introduction: The goal of our study was to report on our experience of laparoscopic surgery at the Mother and Child Hospital of Bingerville. **Patients and Methods:** This was a 6-year retrospective study (October 2018 to October 2024), performed in the pediatric surgery department. We had included all patients operated on laparoscopically. The parameters studied were age, gender, preoperative diagnosis, operative procedure performed, postoperative complications and length of stay. **Results:** We enrolled 108 patients with an average age of 8.71 years (from 09 months to 17 years), 78 of them were male and 30 females. The pathologies concerned were: Simple acute appendicitis (26 cases) and its progressive forms (08 cases), cryptorchidism (non-palpable testicles) (32 cases), caustic esophageal strictures (10 cases), inguinal hernias (4 cases), ovarian cysts (4 cases), Hirschsprung's disease (10 cases), vesicular lithiasis (10 cases), idiopathic megaesophagus (1 case), hiatal hernia (1 case) and non-functioning kidneys (junction syndrome) (02 cases). We performed 32 exploratory laparoscopies and 108 operative laparoscopies. We noted 2 cases of repeat surgery (cryptorchidism) and 4 cases of conversion to laparotomy (appendicular abscess, pelviperitonitis, ovarian cyst). No post-operative complications were observed. The average length of stay was 3.2 days (0 to 17 days). **Conclusion:** Our laparoscopic activity was dominated by appendectomy and orchidopexy. The acquisition of equipment adapted to children would enable us to broaden our indications.

Keywords

Surgery, Laparoscopy, Children

1. Introduction

Laparoscopic or minimally invasive surgery is currently the gold standard in many

surgical indications. It has been very well developed and popularized in the adult population since its early days [1] [2]. It has developed very slowly in pediatric surgery [3]. In Africa, and particularly in Côte d'Ivoire, this approach is still rarely used in pediatric surgery. However, this surgical approach offers numerous advantages: less trauma to tissues, less postoperative pain, shorter hospital stays, earlier duty resumption, less postoperative adhesions, better cosmesis, less blood loss, and lower overall costs [2] [4]. Laparoscopic surgery is not widespread in low- and middle-income countries. The aim of this study was to report on our experience in pediatric laparoscopic surgery.

2. Patients and Methods

We conducted a retrospective descriptive study from October 2018 to October 2024. The study setting was the pediatric surgery unit of the mother-child hospital in Bingerville. All patients undergoing laparoscopic surgery, regardless of diagnosis, were included in the study. The laparoscope used was a storz type, we used 10-mm trocars for 10° optics and 5-mm trocars for the instrument trocars. Laparoscopy was performed when trained senior surgeons were available. Patients had no risk factors. The variables studied were age, sex, preoperative diagnosis, operative procedure performed, postoperative complications and length of stay. Criteria for conversion to laparotomy were the duration of the procedure exceeding one hour and technical difficulties. Data analysis was performed using Epi info 7.2.3.1 software. Qualitative variables were described in terms of frequency and proportion. Quantitative variables were expressed as averages.

3. Results

A total of 108 patients were enrolled during the study period. The mean age of patients was 8.7 years, ranging from 09 months to 18 years. Males were predominantly represented ($n = 78$), with a sex ratio of 2.6. Conditions managed were dominated by acute appendicitis and its progressive complications (31.7%), followed by non-palpable testicles (30%) (Table 1). Laparoscopy was both diagnostic and therapeutic in patients with non-palpable testicles ($n = 32$). In all other patients, laparoscopy was therapeutic. The conversion rate was 3.7%. We performed 4 conversions to laparotomy for: appendicular abscess (2 cases), pelvi peritonitis (1 case) and very large ovarian cyst (1 case). Two patients had been reoperated for testicular reascensions after orchidopexy. There were no intraoperative or postoperative complications. The aesthetic result was excellent. The average length of stay was 3.2 days, with extremes ranging from 0 to 17 days. Resumption of normal activities averaged 7 days, with extremes ranging from 5 to 10 days. No deaths were noted.

4. Discussion

Laparoscopic surgery was introduced in Côte d'Ivoire in April 1999 [1] [2]. It was performed by adult visceral surgeons. They treated both adults and children. The

Table 1. Pathologies and procedures performed.

| Pathologies | Type of laparoscopic procedure | Number | Percentage (%) |
|---|--------------------------------|--------|----------------|
| Acute appendicitis | Appendectomy | 26 | 24 |
| Appendicular peritonitis | | 08 | 7.4 |
| Non palpable testis | One- or 2-stage orchidopexy | 32 | 30 |
| Inguinal hernias | Hernia repair | 04 | 3.7 |
| Ovarian cyst | Cystectomy | 04 | 3.7 |
| Vesicular lithiasis | Cholecystectomy | 10 | 9.2 |
| Caustic esophageal stenosis | Gastrostomy | 10 | 9.2 |
| Idiopathic megaesophagus | Heller procedure | 01 | 0.9 |
| Hiatal hernia | Repair | 01 | 0.9 |
| Hirschsprung's disease | Swenson procedure | 10 | 9.2 |
| Non-functioning kidney in pyeloureteral junction syndrome | Nephrectomy | 02 | 1.8 |

pathologies treated in children were acute appendicitis and complicated forms [2]. For a variety of reasons, pediatric surgeons rarely use this approach. In recent years, however, many pediatric surgeons have been trained in laparoscopic surgery. And its application is becoming more and more common in various hospitals. However, difficulties remain. For example, there is a lack of suitable equipment, and the cost of acquiring and maintaining it is high. Talabi *et al.* in 2015 made the same observation in Nigeria [5].

As soon as it opened in March 2018, our center was equipped with laparoscopic equipment. This enabled us to start our activity in laparoscopic surgery. At the outset, we were supported by adult surgeons. Gradually, we adapted our practice exclusively to the pediatric population.

Appendectomy was the most frequently performed procedure in our study, as reported by some authors [6] [7]. Indeed, it is the most frequent abdominal emergency [8] [9]. It was performed by conventional laparoscopy with three trocars [8]. Or with two trocars, and the appendectomy was performed outside the abdomen through the umbilical orifice. Because of its frequency, it enabled us to acquire basic laparoscopic surgical skills. Moreover, laparoscopy is currently the approach recommended by the World Society of Emergency Surgery (WSES) for the treatment of acute appendicitis [10]. The second indication was non-palpable testicles (30% of our series). Here, laparoscopy offered a double advantage. It helped to diagnose intra-abdominal testicles and to perform the treatment, *i.e.*, orchidopexy, at the same operating time [11] [12].

Other more complex procedures have been performed. These include colectomies for Hirschsprung's disease, nephrectomies, esophageal cardio myotomy for idiopathic megaesophagus in children, and diaphragmatic hernia repair. This tes-

tifies to the level of skill and expertise acquired by our team. However, our indications are still limited by the lack of suitable equipment for children. Today, smaller equipment is available: trocars with a diameter of 3 millimeters [8], or even 2 millimeters [13].

The length of hospital stay in our study was 3.2 days. This is comparable with the literature [14] [15]. Patients who operated for an appendectomy spent one or two days in hospital [5]. Laparoscopic surgery for non-palpable testicles was performed on an outpatient basis. The long length of stay observed (17 days) was attributable to laparoscopic gastrostomies in patients with caustic stenosis of the oesophagus. These patients required nutritional rehabilitation before discharge.

The conversion rate in our study (3.7%) was similar to the literature [16] [17] [18] [19]. There were no intraoperative complications. And there were no deaths. Laparoscopic surgery, therefore, offers a number of advantages, which our study also demonstrated: reduced postoperative pain, rapid return home, satisfactory aesthetic appearance and very few complications [4] [20] [21].

5. Conclusion

Our laparoscopic activity was dominated by appendectomy and orchidopexy. Other indications requiring more complex techniques could be performed laparoscopically. But the number of patients was very small. The acquisition of equipment that is more suited to children would enable us to broaden our indications. In so doing, we're helping popularize this approach in our country.

Consent

Informed consent was obtained for all patients.

Conflicts of Interest

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

References

- [1] Tchente Nguefack, C., Essola, B., Ohandja Ayina, P., Beugheum, C., Massom, A., Nana Njamen, T., *et al.* (2021) Report on the Practice of Laparoscopic Surgery in the Hospitals of the City of Douala in 2017. *Revue Medicale de Bruxelles*, **42**, 455-462. <https://doi.org/10.30637/2021.20-040>
- [2] Casanelli, J.M., Keli, E., N'dri, J., Aboua, G., Keita, M., Meneas, G., *et al.* (2007) Bilan de quatre années de chirurgie laparoscopique à Abidjan. *Medecine Tropicale*, **67**, 481-484.
- [3] Saravanan, K., Kumaran, V., Rajamani, G., Kannan, S., Mohan, N., Nataraj, M., *et al.* (2008) Minimally Invasive Pediatric Surgery: Our Experience. *Journal of Indian Association of Pediatric Surgeons*, **13**, 101-103. <https://doi.org/10.4103/0971-9261.43800>
- [4] Fouogue, J.T., Fouelifack, F.Y., Fouedjio, J.H., Tchounzou, R., Sando, Z. and Mboudou, E.T. (2017) First Steps of Laparoscopic Surgery in a Sub-Saharan African Setting: A Nine-Month Review at the Douala Gynaeco-Obstetric and Pediatric Hospital (Cameroon). *Facts, Views and Vision in ObGyn*, **9**, 105-110.

- [5] Talabi, A., Adisa, A., Adefehinti, O., Sowande, O., Etoneyaku, A. and Adejuyigbe, O. (2015) Early Experience with Laparoscopic Surgery in Children in Ile-Ife, Nigeria. *African Journal of Paediatric Surgery*, **12**, 29-32. <https://doi.org/10.4103/0189-6725.150947>
- [6] Arung, W.K., Tshilombo, F.K., Mukeng, C.K. and Odimba, K.B. (2012) Intestinal Obstructions Complicating Peritoneal Adhesions at the Lubumbashi University Clinics. *Acta Chirurgica Belgica*, **112**, 195-199. <https://doi.org/10.1080/00015458.2012.11680823>
- [7] Kalau, W.A., Dinganga, N., Ngoie, E., Odimba, E. and Detry, O. (2015) First Steps of Laparoscopic Surgery in Lubumbashi: Problems Encountered and Preliminary Results. *Pan African Medical Journal*, **21**, Article 210. <https://doi.org/10.11604/pamj.2015.21.210.6689>
- [8] Meinzer, A., Alkatout, I., Krebs, T.F., Baastrup, J., Reischig, K., Meiksans, R., *et al.* (2020) Advances and Trends in Pediatric Minimally Invasive Surgery. *Journal of Clinical Medicine*, **9**, Article 3999. <https://doi.org/10.3390/jcm9123999>
- [9] Köhler, F., Hendricks, A., Kastner, C., Müller, S., Boerner, K., Wagner, J.C., *et al.* (2021) Laparoscopic Appendectomy versus Antibiotic Treatment for Acute Appendicitis—A Systematic Review. *International Journal of Colorectal Disease*, **36**, 2283-2286. <https://doi.org/10.1007/s00384-021-03927-5>
- [10] Di Saverio, S., Birindelli, A., Kelly, M.D., Catena, F., Weber, D.G., Sartelli, M., *et al.* (2016) WSES Jerusalem Guidelines for Diagnosis and Treatment of Acute Appendicitis. *World Journal of Emergency Surgery*, **11**, 1-25.
- [11] Papparella, A., De Rosa, L. and Noviello, C. (2021) Laparoscopic Fowler-Stephens Orchidopexy for Intra-Abdominal Cryptorchid Testis: A Single Institution Experience. *La Pediatria Medica e Chirurgica*, **42**, Article 224. <https://doi.org/10.4081/pmc.2020.224>
- [12] Papparella, A., Umamo, G.R., Romano, M., Delehay, G., Cascone, S., Trotta, L., *et al.* (2022) In Which Patients and Why Is Laparoscopy Helpful for the Impalpable Testis? *Minimally Invasive Surgery*, **2022**, Article ID: 1564830. <https://doi.org/10.1155/2022/1564830>
- [13] O'Donovan, P.J. and McGurgan, P. (1999) Microlaparoscopy. *Surgical Innovation*, **6**, 51-57. <https://doi.org/10.1177/155335069900600203>
- [14] Zhang, P., Zhang, Q., Zhao, H. and Li, Y. (2020) Factors Affecting the Length of Hospital Stay after Laparoscopic Appendectomy: A Single Center Study. *PLOS ONE*, **15**, e0243575. <https://doi.org/10.1371/journal.pone.0243575>
- [15] Bancke Laverde, B.L., Maak, M., Langheinrich, M., Kersting, S., Denz, A., Krautz, C., *et al.* (2023) Risk Factors for Postoperative Morbidity, Prolonged Length of Stay and Hospital Readmission after Appendectomy for Acute Appendicitis. *European Journal of Trauma and Emergency Surgery*, **49**, 1355-1366. <https://doi.org/10.1007/s00068-023-02225-9>
- [16] Fletcher, E., Seabold, E., Herzing, K., Markert, R., Gans, A. and Ekeh, A.P. (2019) Laparoscopic Cholecystectomy in the Acute Care Surgery Model: Risk Factors for Complications. *Trauma Surgery & Acute Care Open*, **4**, e000312. <https://doi.org/10.1136/tsaco-2019-000312>
- [17] Kama, N.A., Kologlu, M., Doganay, M., Reis, E., Atli, M. and Dolapci, M. (2001) A Risk Score for Conversion from Laparoscopic to Open Cholecystectomy. *The American Journal of Surgery*, **181**, 520-525. [https://doi.org/10.1016/s0002-9610\(01\)00633-x](https://doi.org/10.1016/s0002-9610(01)00633-x)
- [18] Warchałowski, Ł., Łuszczki, E., Bartosiewicz, A., Dereń, K., Warchałowska, M.,

- Oleksy, Ł., *et al.* (2020) The Analysis of Risk Factors in the Conversion from Laparoscopic to Open Cholecystectomy. *International Journal of Environmental Research and Public Health*, **17**, Article 7571. <https://doi.org/10.3390/ijerph17207571>
- [19] Keskin, E.T., Can, O., Özdemir, H., Şam Özdemir, M., Tataroğlu, Ö.D. and Şimşek, A. (2024) Risk Factors of Open Surgery Conversion in Laparoscopic Partial Nephrectomy to Achieve Nephron Sparing. *Annals of Surgical Oncology*, **31**, 3880-3886. <https://doi.org/10.1245/s10434-024-15106-1>
- [20] Kiblawi, R., Zoeller, C., Zanini, A., Kuebler, J.F., Dingemann, C., Ure, B., *et al.* (2021) Laparoscopic versus Open Pediatric Surgery: Three Decades of Comparative Studies. *European Journal of Pediatric Surgery*, **32**, 9-25. <https://doi.org/10.1055/s-0041-1739418>
- [21] Cui, N., Liu, J. and Tan, H. (2019) Comparison of Laparoscopic Surgery versus Traditional Laparotomy for the Treatment of Emergency Patients. *Journal of International Medical Research*, **48**, 1-8. <https://doi.org/10.1177/0300060519889191>