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Indications and Outcomes of Thoracotomies in Limited Technical Facilities of Surgery Department

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Abstract

Objective: To evaluate the technique, indications, and outcomes of thoracotomy within our surgical setting. **Materials and Methods**: We conducted a retrospective, descriptive study at the Thoracic and Cardiovascular Surgery Unit of the Bouaké Teaching Hospital between January 2013 and December 2025. The study covered the records of 115 patients who underwent surgery. **Results**: Thoracotomies accounted for 52.04% (115/221) of surgical approaches used in the Cardiovascular and Thoracic Surgery Unit. The mean age was 29.87 ± 18.69 years, with a sex ratio of 3.79. Most patients were of low socioeconomic status (n = 83; 72.17%). The mean time to consultation at our hospital facility was 1031.69 ± 357.3 hours [ranged: 18 minutes to 3540 hours]. The mean time to surgical intervention was 15.99 ± 6.323 days [range: 1 to 528 days]. Indications included traumatic injuries (n = 45; 39.13%), effusion's pericarditis (n = 35; 30.43%), non-tuberculous pyothorax (n = 23; 20%), sequelae of pulmonary tuberculosis (n = 8; 6.96%), mediastinitis (n = 1; 0.87%), lung tumor (n = 1; 0.87%), pleural tumor (n = 1; 0.87%), and mediastinal tumor (n = 1; 0.87%). Posterolateral thoracotomy was the most frequently performed approach (n = 70; 60.87%). End-sternotomy for pericardial drainage was the most common procedure performed (n = 38; 35.86%). Wound suppuration was the most frequent complication (n = 14; 73.70%). The mean length of hospital stay was 17.28 ± 13.53 days [ranged: 1 - 93 days]. The postoperative mortality rate was 10.43% (n = 12). **Conclusion**: Thoracotomies are frequently performed in young adults, both as emergency and delayed procedures. Our study population was of low socioeconomic status. Thoracotomies are indicated for thoracic infectious diseases, including pyothorax and pericarditis with effusion. A short interval before surgical intervention was not associated with lower postoperative mortality.

Keywords

Indications, Thoracotomy, Bouaké

1. Introduction

Thoracotomies are surgical approaches commonly used in our surgical practice. They provide access to explore the contents of the chest—specifically the lungs, heart, or esophagus—and may be lateral, anterior, and/or posterior.

This approach is the most frequently used by thoracic, cardiovascular, and general surgeons who have access to the necessary specialized facilities [1]. In Côte d'Ivoire, these thoracotomies are performed at both the "Institut de Cardiologie d'Abidjan (ICA)" and the Bouaké Teaching Hospital.

In our setting, the indications for these procedures are dominated by cardiac and infectious pleuropulmonary conditions, with tuberculosis being the most common. Despite the lack of specialized teams for the postoperative care of thoracic surgery patients—aside from the surgeons themselves—we are required to perform these thoracotomies in general surgery facilities. This highlights the importance of evaluating both the indications for these procedures and the surgical outcomes, and of reviewing the situation after a decade of practice.

2. Materials and Methods

Between January 2013 and December 2025 (a thirteen-year period), 115 patients underwent surgery via standard thoracotomy (70 posterolateral thoracotomies, 1 anterolateral thoracotomy and 1 lateral thoracotomy) and sternotomy (43) at the Thoracic and Cardiovascular Surgery Unit. Thoracotomy included standard thoracotomy and sternotomy. This was a retrospective, descriptive study with an analytical component. Data were collected from patients' medical records. The study includes patients who underwent surgery via standard thoracotomy or sternotomy during this period. Excluded from the study are patients who underwent a thoracotomy at another hospital facility and were subsequently transferred to our department, as well as cases with incomplete medical records, unspecified surgical indications, or incomplete operative reports. Reinterventions were not included. The variables studied included epidemiological data (identity, age, sex, occupation, geographic location, address, socioeconomic status [2]), diagnostic data (reason for consultation, time to consultation, time to treatment, final diagnosis), therapeutic data (indications, surgical approaches, surgical procedures), and outcome data (hospital stay, adverse events, postoperative deaths, postoperative complications). In our study, a short time to treatment was defined as three days or less. An acute condition is one that arises abruptly or suddenly and progresses rapidly. A chronic condition develops gradually and progresses slowly. Emergency surgery is an unscheduled medical intervention aimed at treating a condition, injury, or trauma that poses an immediate threat to a patient's life or

functional well-being. The "consultation delay" refers to the time elapsed between the onset of the first symptom and the patient's visit to a healthcare facility. The "surgical intervention delay" is the time between diagnosis and the performance of surgery. The post-operative follow-up period, spanning from hospital discharge to the final appointment, was 12 months.

Microsoft Excel 2019 and Epi Info 7.2.4.0 software were used for data processing. Quantitative variables were expressed as mean ± standard deviations, along with their extreme values. Qualitative variables were expressed as percentages. Proportions were compared using the Chi-square test (with or without Yates' correction) or Fisher's exact test when the conditions for the Chi-square (χ^2) test were not met. Differences were considered statistically significant at $p \leq 0.05$. Means were compared using ANOVA or the Kruskal-Wallis test in cases of high dispersion.

3. Results

One hundred and fifteen (115) thoracotomies were performed out of a total of 221 procedures during the study period (52.04%). These thoracotomies were performed in 26.25% of thoracic surgery cases and 25.79% of cardiac surgery cases.

The mean age of the patients was 29.87 ± 18.69 years, ranging from 0.4 years (4.8 months) to 85 years. The primary age groups were 0 - 20 years and 20 - 40 years, accounting for 35.65% and 34.78% of patients, respectively. Overall, 70.43% of the study population was under the age of 40. Males accounted for 79.13% (n = 91) of the cohort, with a sex ratio of 3.79. Unemployed individuals constituted the most affected group (n = 65; 56.52%). Eighty-three patients (72.17%) were of low socio-economic status. Among the patients who underwent surgery, 60% (n = 69) came from outside the Gbêkê region. The overall mean time to consultation was 1031.69 ± 357.3 hours (42.99 days) [ranged: 0.3 hours (18 minutes) to 3540 hours (147.5 days)]. Mean consultation times were 424 ± 5.7834 hours (17.67 days) for acute conditions and 2761.27 ± 67.361 hours (115.05 days) for chronic conditions (p = 0.25). The overall mean time to surgical intervention was 15.99 ± 6.323 days [ranged: 1 to 528 days]. Mean times to surgical intervention were 3.53 ± 0.403 days for acute conditions and 56.36 ± 12.41 days for chronic conditions (p = 0.15). Among the patients included, 47.83% (n = 55) received early care, with a mortality rate of 9.09%. The remaining 52.17% (n = 60) received delayed care, with a mortality rate of 11.67%. Early surgical intervention was not significantly associated with a reduction in mortality (p = 0.44). The main causes of delay in surgical intervention were a lack of financial resources (41.30%; n = 38) and the unavailability of the surgical kit (28.26%; n = 26). Frontal chest X-rays contributed to the diagnosis in all cases (n = 115). Chest CT scans were performed in 47.83% of cases (n = 55). Echocardiography was performed on 50 patients (43.48% of cases). Indications included traumatic injuries (n = 45; 39.13%), effusion's pericarditis (n = 35; 30.43%), non-tuberculous pyothorax (n = 23; 20%), sequelae of pulmonary tuberculosis (n = 8; 6.96%), mediastinitis (n = 1; 0.87%), lung tumor (n = 1; 0.87%), pleural tumor (n = 1; 0.87%), and mediastinal tumor (n = 1; 0.87%). Posterolateral thoracotomy was the most frequently performed approach (n = 70; 60.87%). End-sternotomy for pericardial

drainage was the most common procedure performed (n = 38; 35.86%). Using local anesthesia (n = 29; 25.22%) and/or general anesthesia (n = 86; 74.78%), a posterolateral thoracotomy—illustrated in Figures 1-4, was performed on 60.87% of patients (n = 70). Emergency surgical procedures performed via this approach were predominantly pericardial drainage (n = 38; 35.86%), as shown in Table 1.



Figure 1. Patient in the lateral decubitus position preoperatively.



Figure 2. Posterolateral thoracotomy incision in a flattened italic S shape.



Figure 3. Operative field via posterolateral thoracotomy (dissection of the muscle layers).



Figure 4. Standard posterolateral thoracotomy via opening of the intercostal space.

Table 1. Emergency procedures performed.

Procedures	n	%
Pericardial drainage	38	35.85
Pulmonary suture	24	22.64
Debridment + chest wall repair	12	11.32
Diaphragmatic suture	12	11.32
Rib fixation (plate and screws)	7	6.61
Sternal fixation (plate)	5	4.73
Myocardial suture	3	2.83
Mammary artery ligation	1	0.94
Intercostal vein ligation	1	0.94
Atypical pulmonary resection	1	0.94
Sternal cerclage with steel wire	1	0.94
Foreign body removal	1	0.94
Total	**106**	**100**

In contrast, elective surgical procedures were predominantly empyemectomy and pleural decortication (n = 33; 36.26%), as shown in Table 2.

The mean duration of postoperative drainage of patients was 12.88 ± 2.040 days [ranged: 1 to 186 days]. Among them, 80% underwent drainage for a period of 5 to 10 days. The mean duration of hospitalization was 17.28 ± 13.53 days [ranged: 1 to 93 days]. Patients with a hospital stay of less than 7 days accounted for 11.54%, while those with a stay exceeding 7 days accounted for 88.46%.

The duration of the postoperative hospital stay was not correlated with the progression of the disease (p = 0.592).

Table 2. Procedures performed during elective surgery.

Procedures	n	%
Empyemectomy and pleural decortication	33	36.26
Biopsy	19	20.88
Lobectomy	16	17.58
Thoracoplasty	15	16.48
Pericardial decortication	4	4.4
Wedge pulmonary resection	2	2.2
De-clotting	1	1.1
Loboisthmectomy	1	1.1
Total	**91**	**100**

Standard thoracotomies were complicated by chest wall suppuration in 18.06% (13/72) of cases. Among the 80 patients who underwent emergency surgery, a complication rate of 47.5% (38/80) was recorded, predominantly sepsis (28.78%) and anemia (27.26%), as summarized in Table 3.

Table 3. Distribution of complications following emergency surgery.

Type of complications		n	%
Haemodynamic	Anemia	18	27.26
	Hypovolemic shock	7	10.61
Pleuropulmonary	Bilateral Pleurisy	1	1.52
	Respiratory distress	1	1.52
	Postoperative emphysema	1	1.52
Infectious	Sepsis	19	28.78
	Chest wall suppuration	11	16.66
	Postoperative pyothorax	5	7.57
	Osteitis	1	1.52
Metabolic	Renal failure	1	1.52
Local	Hematoma	1	1.52
Total		**66**	**100**

Similarly, 54.29% (19/35) of the 35 patients undergoing elective surgery experienced complications, including anemia (40%) and sepsis (20%), as shown in Table 4.

Table 4. Distribution according to postoperative complications following elective surgery.

Types de complications		n	%
Haemodynamic	Anemia	14	40
	Hypovolemic shock	1	2.80
Pleuropulmonary	Respiratory distress	2	5.71
	Bronchopleural Fistula	1	2.86
	Postoperative Emphysema	1	2.86
	Failure of lung re-expansion	1	2.86
Infectious	Sepsis	7	20
	Chest wall suppuration	4	11.42
	Postoperative pyothorax	2	5.71
Local	Hemorrhage	1	2.86
	Parietal hematoma	1	2.86
Total		**35**	**100**

The reoperation rate for these postoperative complications was 5.22%. The occurrence of complications was not associated with the age group [0 to 40 years] ($p = 0.27$), a time to consultation of less than 7 days ($p = 0.427$), or the emergency nature of the surgery ($p = 0.320$).

The overall postoperative mortality rate across all indications was 10.43% ($n = 12$). This rate was 8.75% for emergency cases and 14.29% for elective surgery, with no statistically significant difference ($p = 0.14$). Postoperative mortality was affected by neither the time to consultation ($p = 0.125$) nor the surgical delay ($p = 0.4$).

4. Discussion

In African literature, these thoracotomies are frequently performed on young patients [3] [4]. Indeed, Thomas [3] in Nigeria and Diané [4] in Gabon reported that 66.7% and 60% of patients, respectively, were aged between 20 and 43 years. In contrast, in European populations, over 75% of thoracotomies are performed on patients aged between 60 and 70 years [5]-[7]. The male predominance regarding indications for thoracotomy observed in our study aligns with findings by African authors such as Diané [4] in Gabon and James [8] in Niger, who reported 61.82% and 68.4%, respectively. This male predominance reaches 76.6% and 77.78% in the studies by Softah [9] in Bahrain and Thomas [3] in Nigeria, respectively.

In our study, the long delay before seeking consultation is attributable to an inappropriate and non-standardized patient referral pathway. Indeed, the primary causes are the lack of a casualty evacuation system in the Gbêkê region, on the one hand, and negligence on the part of the patients themselves—encouraged by tra-

ditional healers—on the other.

Despite this delay in seeking consultation, the clinical diagnosis of these conditions is not delayed. Chest X-rays, chest CT scans, and echocardiography provide valuable information and help determine the indications for thoracotomy. Today, the role of computed tomography in establishing indications for thoracotomy is essential [10]-[13].

Thus, the conditions frequently addressed via this surgical approach are pericardial effusion and pyothorax. In Africa, according to Diané [4], James [8], and N'gatchou [1], this thoracotomy is often reserved for pyothorax (whether tuberculous or non-tuberculous), whereas these same authors reserve it only secondarily for chest trauma. While this approach was preferred in our study for pericardial effusion, it is less favored in the studies by Diané [4] and James [8]; the latter prefers pericardiotomy with drainage [8]. In contrast, in Europe, this approach is reserved almost exclusively for malignant tumors [8]. Between 2010 and 2020, the use of video-assisted thoracoscopy grew from 3.7% to over 60% of surgical approaches, relegating conventional thoracotomy to second place [14]. This endoscopic approach is currently gaining wider adoption in Africa. The high cost of video-thoracoscopy systems hinders their acquisition by African hospitals, even though the indications for their use—particularly in emergency settings—are recognized. Our own practice may be explained by the lack of a video-thoracoscopy system.

Across all thoracotomy cases in our study, the average hospital stay was long—similar to the 22.14 ± 7 days reported by James [8]. In contrast, hospital stays in the West [14]-[18] are shorter due to the use of video-assisted thoracoscopy. Despite the long hospital stays in our study, postoperative complications were infrequent; among standard thoracotomies, wound infections were the most common. However, James [8] identified anemia as the primary complication following thoracotomy. Furthermore, our postoperative mortality rate of 10.43% is close to the 10.1% reported by James [8]. This similar post-thoracotomy mortality rate in both studies is attributable to the fact that these procedures were performed in general surgery departments, where limited technical facilities act as a constraint. Consequently, our mortality rates are higher than those reported by N'Gatchou [1] (6%) and Diané [4] (8.5%), where operating rooms were better equipped. A low mortality rate of 5.32% was also observed by Softah [9] in Bahrain, where well-equipped facilities were available. These findings suggest that post-thoracotomy mortality generally ranges between 5% and 8%. These data align with those reported by El Maleh [14] in France, who found an overall post-thoracotomy mortality rate of 5% across all indications. Good post-thoracotomy outcomes depend on improvements in technical facilities and professional performance [9] [14].

5. Conclusion

Thoracotomies are an approach with variable indications. They are frequently performed in young adults in emergency and delayed thoracic and cardiovascular

surgery. Our target population had a low socio-economic level. Trauma is the leading individual indication. These thoracotomies are often intended, in our practice, for infectious thoracic pathologies including pyothorax and fluid pericarditis. The operative consequences, whatever the indications for this approach, are marked by low complication rates, moderate mortality, with a brief hospital stay and a promising clinical outcome. We advocate for minimally invasive thoracotomy and video thoracoscopy in thoracic surgical indications in order to improve this mortality rate.

Ethics Statement

This study was conducted as a retrospective review of existing data. According to the guidelines of the Alassane Ouattara University (Ethic commission)**,** this project was exempt from formal ethics committee approval because it utilized fully de-identified and aggregated data**.** The requirement for informed consent was waived due to the retrospective and observational design. Patient confidentiality was strictly maintained throughout the study by using encoded IDs instead of direct identifiers.

Conflicts of Interest

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

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