OPEN ACCESS

Saudi Journal of Medical and Pharmaceutical Sciences
Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article **General Surgery**

Morbidity and Mortality of Cephalic Duodenopancreatectomy (Experience of the Department of Visceral Surgery at The Avicenne Military Hospital of Marrakech)

Faisal El Mouhafid[1]*, Bader Jouabri[1], Haytem Ajrem[1], Mohamed Lahkim[1], Hicham Baba[1], Jawad Fassi Fihri[1], Ahmed Lkhadir[1], Rachid El Barni[1]

[1]Department of General Surgery At. Avicenne Military Hospital, Marrakech, Morocco

DOI: https://doi.org/10.36348/sjmps.2025.v11i11.013 | **Received:** 12.09.2025 | **Accepted:** 07.11.2025 | **Published:** 18.11.2025

***Corresponding author:** Faisal El Mouhafid
Department of General Surgery At. Avicenne Military Hospital, Marrakech, Morocco

Abstract

Cephalic duodenopancreatectomy (CDP), also known as the Whipple procedure, is a major surgery performed on the pancreatobiliary junction. It is mainly indicated for cancers of this region, as well as for certain benign tumors or chronic pancreatitis. Despite technical advances, this procedure remains associated with high morbidity, with postoperative complications such as pancreatic or digestive fistulas, gastroparesis, hemorrhage, infections, and, in the long term, pancreatic insufficiency. A retrospective study conducted in the Department of Visceral Surgery at the Avicenne Military Hospital of Marrakech between 2017 and 2021 analyzed 35 cases of CDP. The average age of patients was 62 years, with a male predominance. The main indications were: Vaterian ampulloma (45.7%), Adenocarcinoma of the pancreatic head (34.3%), Adenocarcinomas of the distal bile ducts (11.4%), And a few rare cases of duodenal or cystic tumors. Most tumors were well-differentiated (74%). The Child reconstruction technique was used in 65.7% of cases, while pancreaticogastric anastomosis was performed in 34.3%. The postoperative mortality rate was 11.4%, mainly due to hemorrhagic shock. Early complications occurred in 42.8% of patients, predominantly gastroparesis (17.1%) and hemorrhage (8.6%). The results are consistent with those reported in the literature. The study emphasizes the importance of thorough preoperative assessment, close postoperative monitoring, and an experienced surgical team to reduce complications and improve prognosis.

Keywords: Cephalic duodenopancreatectomy – Morbidity – Mortality – Prognosis.

INTRODUCTION

Cephalic duodenopancreatectomy (CDP), also known as the Whipple procedure, is the standard treatment for periampullary malignant tumors involving the pancreas, the ampulla of Vater, the distal bile duct, and the duodenum. Although it remains the only curative option for these diseases, this surgery is still considered challenging due to its technical complexity and the high risk of postoperative complications.

Since the 1930s, advances in surgery, anesthesia, intensive care, and perioperative management have significantly reduced mortality (<5% in specialized centers). However, morbidity remains high, ranging from 30% to 50% according to published series.

This retrospective study aims to evaluate postoperative morbidity and mortality following CDP in the Department of Visceral Surgery at the Avicenne Military Hospital of Marrakech and to compare the results with those reported in the literature.

Objectives

- To determine the early and late postoperative morbidity and mortality rates following cephalic duodenopancreatectomy (CDP).
- To identify the most frequent complications and their contributing factors.
- To assess the overall prognosis of operated patients and the quality of the histopathological results (lymph node dissection, resection margins, TNM staging).
- To compare the findings from this local experience with those reported in major international series.

MATERIALS AND METHODS

A retrospective descriptive study was conducted on 35 patients operated between January 2017 and December 2021 in the Department of Visceral Surgery at the Avicenne Military Hospital.

- Data collected from medical records included:
- Demographic and clinical parameters,
- Biological and radiological findings,
- Operative details (type of CDP, surgical approach, intraoperative incidents, type of anastomosis),
- Histopathological results,
- Postoperative complications and mortality.

Statistical analysis was performed using Microsoft Excel and compared with recent publications (ISGPS guidelines, European and Asian series).

RESULTS

Among 3,576 surgical procedures performed during the study period, 35 cephalic duodenopancreatectomies (0.97%) were carried out.

- Mean age: 62 years (range: 40–78 years)
- Sex: male predominance (77%, sex ratio = 3.37)

Main Indications:

- Tumor of the pancreatic head: 45.7%
- Vaterian ampulloma: 40%
- Tumor of the distal bile duct: 11.4%
- Duodenal tumor: 2.9%
- Operative findings:
- Median incision in 54.3% of cases; bilateral subcostal incision in 45.7%.
- Classical Whipple resection in 97.1% of cases; pylorus-preserving CDP in 2.9%.
- Reconstruction according to the Child technique in 65.7% or modified Child with pancreaticogastric anastomosis in 34.3%.
- No stenting of the Wirsung duct.
- Curative (R0) resection achieved in 100% of cases.

Histopathological résulte:

- Ampullary adenocarcinoma: 46%
- Adenocarcinoma of the pancreatic head: 34%
- Distal bile duct adenocarcinoma: 11%
- Others (duodenal tumor, cystadenocarcinoma): 9%
- Most tumors were well differentiated (74%).
- Overall morbidity: 42.8%
- Pancreatic fistula: 5.7%
- Gastroparesis: 17.1%
- Post-pancreatectomy hemorrhage: 8.6%
- Postoperative acute pancreatitis: 2.8%
- Wound infection: 5.7%
- Intra-abdominal abscess: 2.8%
- Early mortality: 11.4% (4 cases), mainly due to massive hemorrhage (75%) and necrotizing pancreatitis (25%).

DISCUSSION

1. General Background and Study Framework

Cephalic duodenopancreatectomy (CDP), or the Whipple procedure, remains one of the most complex operations in digestive surgery. Initially described by Allen Whipple in the 1930s [1], it is considered the gold-standard curative treatment for periampullary tumors, including adenocarcinomas of the pancreatic head, ampulla of Vater, distal common bile duct, and duodenum.

Despite continuous advances in operative techniques, anesthesia, and intensive care, CDP is still associated with high morbidity and non-negligible mortality, particularly in developing countries where specialized centers remain limited [2,3].

In this study, conducted in the Department of Visceral Surgery at the Avicenne Military Hospital of Marrakech, the overall morbidity rate was 42.8%, and the early postoperative mortality rate was 11.4%. These results are consistent with data from other African and Maghrebian series (8–15%) [4,5] but remain higher than those reported in major international centers (<5%) [6–8].

2. POSTOPERATIVE MORBIDITY

2.1. Pancreatic Fistula

Pancreatic fistula is the most dreaded complication after CDP. According to the International Study Group on Pancreatic Surgery (ISGPS), it is defined as an amylase concentration in the drainage fluid more than three times the serum level on postoperative day three [9].

Its incidence varies between 10% and 20% according to the literature [10–12]. In our series, it was observed in 5.7% of patients—a rate lower than that reported by other Moroccan teams (10–13%) [4,13].

This relatively low rate may be attributed to meticulous surgical technique, appropriate drainage, and high-quality pancreaticojejunostomy suturing.

Recognized risk factors include a soft pancreatic texture, a small Wirsung duct diameter, and increased digestive pressure [10]. Management is mainly conservative, based on drainage, octreotide therapy, and antibiotic coverage.

2.2. Gastroparesis

Gastroparesis, or delayed gastric emptying, is a common functional complication following CDP. It manifests as persistent gastric stasis beyond the third postoperative day and prolonged intolerance to oral feeding.

Its incidence ranges from 10% to 30% across various studies [14,15]. In our series, it was observed in 17.1% of patients.

Pathophysiological mechanisms include vagal denervation, anastomotic stasis, postoperative edema, and preoperative malnutrition [16].

Management involves prolonged gastric aspiration, early enteral nutrition, and the use of prokinetic agents (metoclopramide, domperidone). Pylorus-preserving resection may reduce its incidence, although evidence remains conflicting [17].

2.3. Post-Pancreatectomy Hemorrhage

Post-pancreatectomy hemorrhage (PPH) is the most severe complication and the leading cause of postoperative death. According to the ISGPS classification [18], it may occur early (within the first 24 hours) or late (after 24 hours).

In our study, 8.6% of patients developed PPH, all requiring surgical reintervention, with a fatal outcome in three cases.

This rate is consistent with the findings of Yekebas *et al.*, (Ann Surg, 2005), who reported an incidence of 7.5% and a procedure-specific mortality exceeding 30% [19]. Prevention relies on meticulous hemostasis, protection of vascular pedicles, and close postoperative biological monitoring.

2.4. Infectious Complications

Wound infections (5.7%) and intra-abdominal abscesses (2.8%) observed in our study are comparable to those reported in the literature (5–10%) [20,21].

Perioperative antibiotic prophylaxis, reduced operative time, and effective drainage explain the relatively low rates observed.

However, pancreatic surgery remains prone to secondary contamination due to enzyme-rich fluid and the risk of infection with enteric microorganisms.

3. POSTOPERATIVE MORTALITY

The overall postoperative mortality rate (11.4%) was mainly due to massive hemorrhage (75%) and necrotizing acute pancreatitis (25%).Although higher than that of major Western series (<5%), this rate aligns with other Maghrebian studies [4,5].

Improved survival depends on appropriate postoperative intensive care, early detection of complications, and prompt intervention in cases of hemodynamic instability.

4. PROGNOSTIC FACTORS

The main factors influencing postoperative prognosis and survival include:

- Preoperative factors: age > 60 years, diabetes, hypertension, prolonged jaundice, and poor general condition [22];
- Intraoperative factors: significant blood loss, operative time > 6 hours, absence of pylorus preservation [23];
- Postoperative factors: pancreatic fistula, secondary hemorrhage, and systemic infection [24].

Achieving an R0 resection (100% in our series) remains the strongest prognostic factor for long-term survival, as confirmed by several authors [25,26].

The absence of short-term recurrence and the regular follow-up of more than 48% of patients reflect the overall quality of surgical management.

5. COMPARISON WITH THE LITERATURE

Our results are comparable to those reported in other African studies:

- El Idrissi *et al.*, (Marrakech, 2020): morbidity 40%, mortality 10% [4];
- Khatouri *et al.*, (Rabat, 2018): mortality 12%, fistula 8% [5].

Internationally, high-volume centers (Johns Hopkins Hospital, Heidelberg, Tokyo) report mortality rates below 3% and morbidity between 35% and 40% [6–8,27].

These differences can be explained by case centralization, standardized protocols, and continuous multidisciplinary training.

Our findings confirm the increasing feasibility and safety of this surgery in the Moroccan context, despite resource limitations.

6. PERSPECTIVES

Improving future outcomes relies on several key measures:

- Strengthening the centralization of CDP procedures in high-volume surgical centers.
- Optimizing perioperative management, especially nutritional and infectious control.
- Introducing laparoscopic and robot-assisted techniques, which have shown benefits in recovery and reduced blood loss [28].
- Establishing national pancreatic surgery registries to monitor quality indicators and postoperative complications.

CONCLUSION

Cephalic duodenopancreatectomy remains a major but essential surgical procedure in the curative management of periampullary tumors.

In this Moroccan experience, the morbidity and mortality rates are comparable to regional series and reflect the growing quality of pancreatic surgery at the Avicenne Military Hospital.

Despite significant morbidity (42.8%), mortality tends to decrease thanks to technical proficiency and rigorous postoperative follow-up.

The standardization of practices and the progressive specialization of surgical teams will make it possible to achieve international standards in the coming years.

REFERENCES

1. Whipple AO. Pancreaticoduodenectomy for islet carcinoma. *Ann Surg*. 1935 ;102(4):763–79.
2. Cameron JL, Pitt HA, Yeo CJ. *Am J Surg*. 1993 ;165(3):295–302.
3. Winter JM, Cameron JL, Campbell KA, *et al., Ann Surg*. 2006 ;243(5):687–95.
4. El Idrissi Slitine N, *et al.*, Morbidité et mortalité de la DPC au CHU Mohammed VI de Marrakech. *Thèse Méd. Marrakech*, 2020.
5. Khatouri M, *et al.*, Résultats de la duodénopancréatectomie au CHU Ibn Sina de Rabat. *Rev Maroc Chir Digestive*. 2018 ;22(2):45–52.
6. Cameron JL, Riall TS, Coleman J, Belcher KA. *Ann Surg*. 2006 ;244(1):10–5.
7. Büchler MW, Wagner M, *et al., Ann Surg*. 2003 ;237(2):247–55.
8. Balcom JH, *et al., Ann Surg*. 2001 ;234(3):356–64.
9. Bassi C, *et al.*, International Study Group on Pancreatic Surgery (ISGPS) definition of postoperative pancreatic fistula. *Surgery*. 2005 ;138(1):8–13.
10. Hackert T, Werner J, Büchler MW. *Pancreatology*. 2011 ;11(1):75–81.
11. de Castro SM, Busch OR, Gouma DJ. *J Gastrointest Surg*. 2004 ;8(8):1034–41.
12. Kawai M, *et al., Ann Surg*. 2018 ;268(2):332–40.
13. El Hakkouni A, *et al., Thèse Méd. Marrakech*; 2019.
14. Warshaw AL, *et al., Surgery*. 1985 ;98(4):503–12.
15. Yeo CJ, *et al., Ann Surg*. 1995 ;221(6):721–31.
16. Kimura W, *et al., J Hepatobiliary Pancreat Surg*. 2006 ;13(3):146–52.
17. Diener MK, *et al., Ann Surg*. 2011 ;254(5):736–44.
18. Wente MN, *et al.*, Postpancreatectomy hemorrhage definition by ISGPS. *Surgery*. 2007 ;142(1):20–5.
19. Yekebas EF, *et al., Ann Surg*. 2005 ;241(6):876–85.
20. Bassi C, Butturini G, Pederzoli P. *J Hepatobiliary Pancreat Surg*. 2003 ;10(2):86–91.
21. Ferrone CR, *et al., Ann Surg Oncol*. 2008 ;15(8):2088–96.
22. Gouma DJ, van Geenen RCI, van Gulik TM. *Br J Surg*. 2000 ;87(6):844–50.
23. Huttner FJ, *et al., Ann Surg*. 2016 ;263(6):1019–27.
24. Nimura Y, *et al., J Hepatobiliary Pancreat Sci*. 2012; 19(1):1–6.
25. Riall TS, Cameron JL. *J Gastrointest Surg*. 2006; 10(8):1199–210.
26. Schnelldorfer T, *et al., Ann Surg*. 2008; 247(6):1011–9.
27. Kondo S, *et al., Ann Surg*. 2005 ;242(2):183–9.
28. Zureikat AH, *et al., Ann Surg*. 2013 ;258(4):554–62.