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# Surgical Management of Pancreatic Insulinoma: Experience from the Visceral Surgery Department, Arrazi Hospital, University Hospital Center Mohammed VI

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**Abstract** **Original Research Article**

Insulinoma, the most common pancreatic neuroendocrine tumor, poses challenges in diagnosis due to its small size, which can evade detection through imaging and even surgical exploration. While medical treatment can manage insulin overproduction, surgical excision remains the only definitive treatment. This article presents a retrospective study on the management of insulinomas in the visceral surgery department of Arrazi Hospital, university hospital Mohammed VI, over a six-year period. This study emphasizes the importance of early diagnosis and effective surgical intervention in the management of insulinomas.

**Keywords :** Insulinoma - Pancreatic neuroendocrine tumor - Hypoglycemia- Surgical management.



## INTRODUCTION

Insulinoma is a rare neoplasm belonging to the group of pancreatic neuroendocrine tumors, yet it is the most frequently observed type among them [1]. Although its prevalence is low, the diagnosis and management of insulinomas present considerable challenges due to their small size, which often makes them difficult to detect with conventional radiological imaging methods [2]. In some cases, insulinomas can even evade detection during surgical exploration [3].

Characterized by excessive insulin secretion, insulinomas lead to episodes of hypoglycemia that can be severe, significantly impacting patients' quality of life [4]. While medical treatment can manage insulin overproduction, surgical excision remains the only radical approach to effectively eliminate the disease [5].

## METHODS

A retrospective study was conducted in the visceral surgery department at CHU Mohammed VI in Marrakech from January 2017 to December 2023. And we included 7 patients with insuloma

The objectives of our study are to determine the epidemiological characteristics, describe the clinical, biological, and radiological aspects, and define the elements of surgical management for insulinomas. We analyzed cases of insulinoma over a six-year period, contributing to the existing literature on this rare condition.

## RESULTS

In our six-year study from 2017 to 2023, 7 patients were diagnosed with insulinoma, resulting in an average incidence of 1 case per year. a sex ratio of 1.33 (F/H), and a mean age of 42 years.

The median duration of symptoms before diagnosis was 2.3 years, highlighting the prolonged period during which patients experience hypoglycemic episodes before a definitive diagnosis is made.

Diagnosis was based on hypoglycemia episodes alongside inappropriate levels of insulinemia, C-peptide, and fasting glucose.

| | Patient 1 | Patient 2 | Patient 3 | Patient 4 | Patient 5 | Patient 6 | Patient 7 |
|---|---|---|---|---|---|---|---|
| Glycémie | 0.42 g/l | 0.35g/l | 0.5g/l | 0.2g/l | 0.28g/l | 0.37g/l | 0.3g/l |
| Insulinémie | 30 µUI/ml | 100.9 µUI/ml | 22.6 µUI/ml | 46.7 µUI/ml | 19.05 µUI/ml | 49.2 µUI/ml | 20.67 µUI/ml |
| Peptide c | 4 ng/ml | 7.12ng/ml | 3ng/ml | 5.4ng/ml | 3.24ng/ml | 5.46ng/ml | 6.46ng/ml |
| Cortisolémie | 143ng/ml | 149.8ng/ml | 91.8ng/ml | 101.1ng/ml | 115.4ng/ml | 100.2ng/ml | 140.5ng/ml |
| TSH | 1.68 µUI/ml | 1.38 µUI/ml | 2.02 µUI/ml | 1.20 µUI/ml | 1.49 µUI/ml | 0.96 µUI/ml | 0.98 µUI/ml |
| Calcémie | 94 mg/l | 92 mg/l | 93 mg/l | 86 mg/l | 98 mg/l | 90 mg/l | 107 mg/l |
| Phosphorémie | 34 mg/l | 45 mg/l | 32 mg/l | 37 mg/l | 29 mg/l | 30 mg/l | 39 mg/l |
| PTH | 39.3pg/ml | 25.2 pg/ml | 29 pg/ml | 26.1 pg/ml | 31.1pg/ml | 25.3pg/ml | 1591 pg/ml |
| Prolactinémie | 16.07ng/ml | 8.03 ng/ml | 13.03ng/ml | 14.7 ng/ml | 19.3 ng/ml | 20.55ng/ml | 4700 ng/ml |
| LH | 7 UI/L | 1.5 UI/L | 3.8 UI/L | 6 UI/L | 5UI/L | 6UI/L | 0.1 UI/L |
| FSH | 4 UI/L | 2 UI/L | 2.2 UI/L | 4 UI/L | 3UI/L | 4UI/L | 0.2 UI/L |

**Figure 1: A table summarizing the main biological tests**

All patients in our study presented with a single insulinoma, with a median tumor size of 15 mm.

Preoperative imaging techniques, including computed tomography (CT), magnetic resonance imaging (MRI), and octreoscan, demonstrated a sensitivity of 100%.

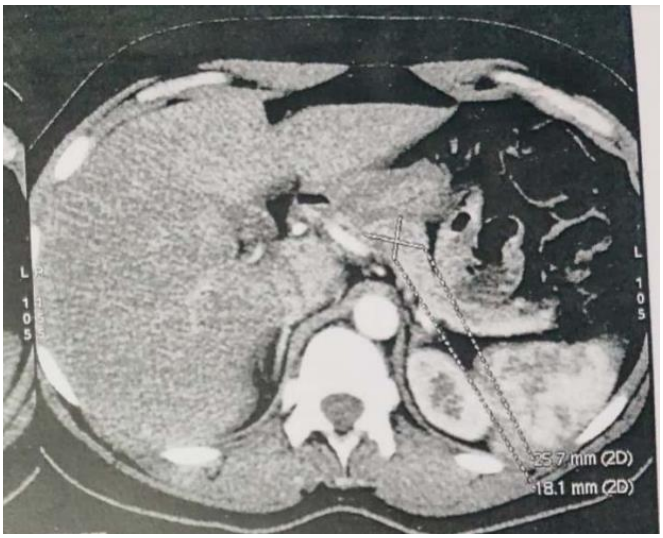


**Figure 2: Imaging from a CT scan showing a tumor of the pancreatic isthmus measuring 18 mm**

The intraoperative exploration also yielded a 100% sensitivity rate, allowing for precise identification of the tumor during surgery. The choice of parenchymal-sparing surgery via laparotomy was successfully executed in all cases, emphasizing the feasibility of preserving pancreatic tissue while effectively removing the insulinoma.

The distribution of insulinomas in the different parts of the pancreas was as follows: 2 cases in the isthmus, 3 cases in the tail, 1 case in the body, and 1 case in the head.

Six patients underwent pancreatic enucleation, accounting for 86% of the cases. And only one patient underwent a distal pancreatectomy, accounting for 14% of the cases.

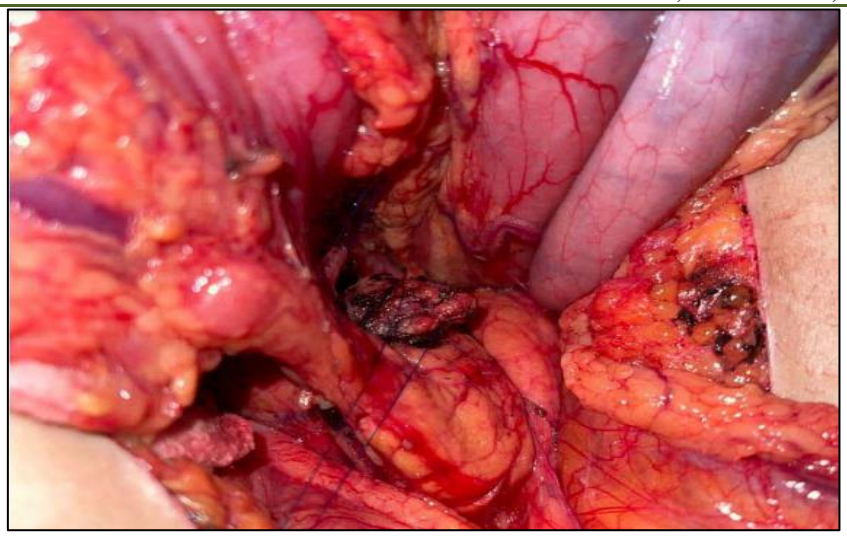

**Figure 3: Preoperative view of an insulinoma located in the head of the pancreas (tumor marked by the thread)**

Despite the surgical success, we observed an overall morbidity rate of 72%. Histologically, the predominant grade of the insulinomas in our cohort was classified as TNEG2 according to the WHO 2019 classification, which indicates a moderately differentiated tumor with a potential for more aggressive behavior compared to lower-grade insulinomas.

Long-term follow-up results were promising, with 86% of patients experiencing favorable outcomes post-surgery. However, it is notable that 14% of patients developed diabetes, possibly due to the disruption of pancreatic function following tumor excision.

## DISCUSSION

The management of insulinoma presents unique challenges due to the rarity of the tumor and the variability in its presentation. In our study, we found that the majority of patients had a single insulinoma, with a median size of 15 mm, which is consistent with the literature indicating that insulinomas are often small and may go undetected for extended periods [1].

The median duration of symptoms before diagnosis was 2.3 years, highlighting the difficulty in recognizing the condition promptly. Patients often experience recurrent episodes of hypoglycemia, which can lead to severe complications if not diagnosed and managed effectively. This delay underscores the importance of increased awareness among healthcare providers regarding the potential signs and symptoms of insulinoma, particularly in patients presenting with unexplained hypoglycemia [2].

Preoperative imaging techniques, including CT, MRI, and octreoscan, showed 100% sensitivity in our study. This finding is crucial, as accurate localization of the tumor is essential for effective surgical intervention. Intraoperative exploration also yielded a 100% sensitivity rate, allowing for precise identification of the insulinoma, which reinforces the importance of thorough surgical assessment [3].

The choice of parenchymal-sparing surgery via laparotomy was successfully executed in all cases, achieving a 100% success rate. This approach not only ensures the removal of the tumor but also preserves pancreatic tissue, which is vital for maintaining endocrine and exocrine functions [4]. However, despite the successful surgical outcomes, we observed a morbidity rate of 72%. This high rate can be attributed to the complexities of pancreatic surgeries and the potential for postoperative complications [5].

Histologically, the majority of insulinomas in our cohort were classified as TNEG2 according to the WHO 2019 classification, indicating a moderately differentiated tumor. This classification is significant, as it can guide postoperative management and long-term follow-up strategies [6].

Long-term follow-up revealed favorable outcomes in 86% of patients, although 14% developed diabetes postoperatively. This aspect highlights the need for ongoing monitoring of blood glucose levels and potential interventions to manage diabetes in patients who have undergone insulinoma resection [7].

## CONCLUSION

Insulinoma remains a rare but significant pancreatic neuroendocrine tumor that poses unique diagnostic and therapeutic challenges. Our study highlights the critical role of early diagnosis through effective imaging techniques, which demonstrated a high sensitivity in localizing tumors. Surgical intervention, particularly parenchymal-sparing procedures, proves to be the most effective treatment, resulting in favorable long-term outcomes for the majority of patients. However, the relatively high morbidity rate and the incidence of postoperative diabetes underscore the need

for careful management and follow-up. Ongoing research is essential to further enhance our understanding of insulinomas and to refine treatment strategies, ensuring better patient outcomes in the future.

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