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Assessment of nutritional status and biochemical parameters after one month of biliary drainage for malignant biliary stenosis: about 70 cases

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Abstract

Background and objective: Malignant biliary strictures are characterized by a poor prognosis that limits therapeutic options. Endoscopic biliary drainage is widely recognized as the gold standard treatment for these patients. The aim of our study was to assess the impact of biliary drainage on patients' nutritional status. Methods: We reviewed data from patients who underwent successful endoscopic drainage at the IBN SINA University Hospital in Rabat, Morocco, between January 2019 and December 2023. Parameters studied included current weight, body mass index (BMI), nutritional risk index (NRI), frequency of vomiting, albumin level (ALB), C-reactive protein (CRP) and total bilirubin (BT). All these parameters were assessed before and after 1 month of drainage. Results:70 patients, with a mean age of 59.29±13 years. Mean weight increased significantly: from 53.03 ± 9.85 kg before drainage to 57.4 kg ± 10.03 after 1 month of drainage. Mean BMI after drainage was 19.8 ± 3.63 kg/m2, compared with 18.06 kg/m2±3.65 before drainage. Severe undernutrition was significantly reduced, with 8.5% of patients showing normal nutrition. 84.3% of patients were vomit-free after 1 month of drainage. ALB levels increased (32.59g/l ± 5.38), while CRP levels decreased after 1 month of drainage. Total bilirubin also decreased after drainage (from 217mg/l to 25.28mg/l). Conclusions: Our study demonstrates the effectiveness of endoscopic palliative treatment in improving patients' condition, notably by alleviating disabling symptoms and restoring digestive functions. This improvement has a positive impact on patients' nutritional status and quality of life.

Keywords: endoscopic biliary drainage, tumor biliary stenosis, nutritional status, palliative treatment

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1. Introduction

The pancreaticobiliary system comprises the pancreas, gallbladder and bile ducts. These organs work together to digest fats. Cancerous tumors can develop in this system, blocking the bile ducts. This blockage, known as biliary obstruction, is a frequent complication. Two types of biliary obstruction can occur, either extrinsic compression where the tumor presses on the bile ducts from the outside, or internal growth, in which case the tumor grows inside the bile ducts. The most common cancers causing biliary obstruction are pancreatic cancer (pancreatic adenocarcinoma) and bile duct cancer (cholangiocarcinoma) [1]. The pancreatic head is a veritable cancer nest, accounting for around 70% of cases [2]. The distal part of the bile ducts is less affected by cholangiocarcinoma than the proximal part but is not spared (20-30% of cases) [3]. Although gallstones are the most frequent cause, the spectrum of conditions affecting the gallbladder includes less common issues like duodenal adenocarcinoma, lymphoma, and metastatic disease. Additionally, biliary cholangiocarcinoma, the most prevalent biliary tract cancer (accounting for 60%), can develop in the bile ducts near the gallbladder, potentially causing complications. Biliary obstruction, a frequent and often asymptomatic complication, can delay diagnosis and have a major impact on morbidity. Patients with locally advanced or metastatic disease may present with weight loss, itching, malaise, abdominal discomfort, or pain. Obstructive jaundice, a serious complication of biliary obstruction, can lead to cholangitis [5], [6]. Complete surgical resection is the best treatment option for curing malignant biliary obstruction [7].

While complete surgical removal offers the best chance of cure, it's often not feasible for advanced pancreatobiliary tumors due to several factors. These include late-stage diagnosis, the tumors' aggressive nature, and the high risks associated with complex surgeries, especially in older patients. Consequently, palliative care, which focuses on

managing symptoms and improving quality of life, becomes crucial for these patients. The low 20% resection rate for periampullary tumors underscores the significant challenges in treating advanced cases [8], [9]. In this context, for patients with inoperable tumors blocking their bile ducts (malignant biliary obstruction), endoscopic prosthetic biliary drainage provides a minimally invasive lifeline. This procedure restores bile flow, alleviating the associated symptoms like itching, infections, and pain. It also prevents liver failure from bile buildup, ultimately improving patients' quality of life [10]. This study embarks on a crucial mission to unveil the profound influence of biliary drainage on two fundamental aspects of well-being for patients grappling with malignant stenosis: nutritional status and biochemical parameters. By analyzing these markers, we can gain insights into the effectiveness of biliary drainage.

2. Materials and Methods

2.1. Study design

The present study was conducted at the Department of Functional and Digestive Operations at CHU Ibn Sina in Rabat, Morocco, conducted a study to examine the effects of endoscopic biliary drainage on patients suffering from malignant biliary obstruction. The study, which took place between January 2019 and December 2023, included 70 participants who all had confirmed malignant obstruction diagnosed through medical imaging and required the drainage procedure. To ensure participants fully understood and agreed to participate, only those capable of providing informed consent were included.

2.2. Measured variables

The study was carried out by retrospective analysis of patients' medical records (age, sex, history, anthropometric measurements, biological analyses, nutritional risk factors).

2.2.1. Anthropometric parameters

Nurses tracked changes in nutritional status by measuring participants' height and weight before and after biliary drainage. These measurements were used to calculate their Body Mass Index (BMI), a widely used indicator of weight relative to height. BMI is derived by dividing weight in kilograms by the square of height in meters. Following established criteria, participants were classified as underweight (BMI < 18.5 kg/m²), normal weight (BMI 18.5-24.9 kg/m²), or overweight (BMI > 29.9 kg/m²) [11].

2.2.2. Biological parameters

Biological parameters, including total bilirubin, C-reactive protein, and albumin, were obtained from patients' medical records through blood test results.

2.2.3. Nutritional risk factors

Researchers assessed the nutritional risk of participants using the Nutritional Risk Index (NRI) [5], which considers protein-calorie malnutrition. The NRI is calculated using the following equation:

$$NRI = 1.519 \times Albumin\ (g/L) + 0.417 \times \left(\frac{Current\ weight}{Normal\ weight}\right) \times 100$$

Based on the calculated NRI score, participants were classified as follows:

- Severely malnourished: NRI < 83.5
- Moderately malnourished: 83.5 ≤ NRI < 97.5
- Normal nutritional status: NRI ≥ 97.5

2.2.4. Frequency of vomiting

The frequency of vomiting experienced by participants was meticulously documented, categorized as absent: No episodes of vomiting reported, occasional: One to three episodes of vomiting reported within the monitoring period, daily: Four or more episodes of vomiting reported within the monitoring period. To ensure comprehensive data collection, these parameters were assessed at two distinct time points : Baseline : Before undergoing endoscopic biliary drainage, follow-up: One month after the endoscopic biliary drainage procedure.

2.3. Statistical analysis

Statistical analysis of the study utilized SPSS software (version 26.0). To understand the data, researchers employed descriptive statistics. This involved calculating average values (means) and how spread out the data was (standard deviations) for continuous variables like weight and albumin levels. For categorical data like vomiting frequency, the analysis reported the number of occurrences and their percentages. To assess changes in nutritional status before and after biliary drainage, a paired-samples t-test was used. This test is specifically designed for comparing data from the same individuals before and after an intervention. A statistically significant result, indicated by a p-value less than 0.05, meant that the observed difference between pre- and post-drainage measurements was unlikely due to chance and likely reflected a true effect of the intervention.

2.4. Ethical considerations

The study was conducted in compliance with the principles of the Declaration of Helsinki. Data collection and storage were secured, access to data was limited to authorized persons, and codes and pseudonyms were used to anonymize data.

3. Results and Discussions

3.1. Patient characteristics

The characteristics of the patients included in this study are presented in Table 1.

3.2. Assessment of nutritional status

3.2.1. Nutritional parameters

Table 2 summarizes the changes observed in weight, BMI, NRI, and vomiting frequency before and after biliary drainage. The average weight of participants significantly increased from 53.03 kg ± 9.85 before drainage to 57.4 kg ± 10.03 one month after ($p = 0.000$). This represents a mean improvement of approximately 4.4 kg. Similarly, BMI also showed a statistically significant increase, rising from 18.06 ± 3.65 kg/m² to 19.80 kg/m² ± 3.63 ($p = 0.000$). Endoscopic biliary drainage significantly improved nutritional status and reduced vomiting frequency in study participants. Before the procedure, a large majority (84.3%) were classified as severely undernourished based on the NRI. This number significantly decreased ($p < 0.05$) after one month, with only 42.8% remaining severely undernourished. Encouragingly, 8.5% of the participants even achieved normal nutritional status (NRI > 97.5). Similarly, vomiting frequency saw a marked improvement. Prior to drainage, 60% experienced occasional vomiting and 30% suffered daily vomiting. One month later, these numbers drastically dropped to 14.2% and 1.4%, respectively, with 84.3% reporting no vomiting at all ($p < 0.05$). Detailed data on these observations can be found in Table 2.

3.2.2. Biological parameters before and after drainage

Table 3 summarizes the changes observed in key biochemical indicators following biliary drainage. Albumin levels showed a significant increase, rising from an average of 28.32 g/l before drainage to 32.59 g/l one month after ($p = 0.000$). Conversely, C-reactive protein (CRP) levels exhibited a significant decrease, dropping from a mean of 52.56 mg/l before drainage to 29 mg/l one month later ($p = 0.003$). Similarly, total bilirubin levels also displayed a marked reduction, going from 217.04 mg/l before drainage to 25.28 mg/l after one month ($p = 0.000$). This study investigated the impact of endoscopic biliary drainage on the nutritional status of patients suffering from malignant biliary stenosis. We compared their nutritional parameters before and one month after the drainage procedure. Patients with malignant biliary obstruction often experience significant nutritional challenges due to disease-related complications. By analyzing various parameters, our study aimed to demonstrate the crucial role of this drainage technique in palliative care. Endoscopic biliary drainage improves the quality of life for these patients by restoring their nutritional status. Biliary drainage demonstrably improved the nutritional status of all patients, as evidenced by a significant increase in both weight and body mass index (BMI) following the procedure ($p=0.000$). On average, patients' BMI rose from 18.06 kg/m² before drainage to 19.8 kg/m² after just one month, highlighting a positive shift towards a healthier weight range. This weight gain suggests improved muscle mass and potentially reduced nutritional deficiencies, potentially contributing to enhanced overall well-being for these patients. Furthermore, a remarkable improvement was observed in vomiting frequency within this patient population. Notably, 84.3% of patients reported no vomiting after 1 month, highlighting a marked reduction compared to the pre-drainage period ($p=0.000$). This significant decrease suggests that endoscopic biliary drainage effectively alleviated vomiting, potentially improving patients' quality of life and reducing their discomfort. Endoscopic surgery led to significant improvements in key biological parameters. Albumin levels (ALB), a crucial indicator of protein synthesis and nutritional status, significantly increased after one month of drainage. The mean ALB level rose from 28.32 g/l before drainage to 32.59 g/l after ($p=0.000$). These findings align with similar observations reported by Peiyuan Cui et al., who also documented a notable increase in albumin levels following drainage at both 1 and 3 months [12]. Biliary drainage demonstrably reversed the tide of bilirubin accumulation, leading to a remarkable improvement. The average total bilirubin (BT) level plummeted from a staggering 217.04 mg/l before the procedure to a significantly lower 25.28 mg/l after just one month ($p = 0.000$). This aligns perfectly with the findings of Bugra Tolga Konduk et al., who observed a similarly remarkable reduction in bilirubin levels following stent placement within a month [13]. Endoscopic biliary drainage demonstrated its effectiveness beyond bile flow restoration, also significantly reducing inflammation. Following the procedure, patients experienced a notable decrease in C-reactive protein (CRP), a key marker of inflammation. The average CRP level dropped from a concerning 52.56 mg/l before drainage to a significantly lower 29 mg/l after just one month ($p=0.003$). These findings align with observations by Pavic et al., who reported similar reductions in CRP following bile flow restoration after 28 days [14]. However, their study also cautioned that this positive trend might not be sustained in the long term. All patients experienced a positive change, significantly reducing their level of undernutrition as measured by the Nutritional Risk Index (NRI). The NRI scores clearly improved after drainage. After one month, only 8.5% of patients showed no signs of undernutrition, compared to none before drainage. Similarly, the proportion of patients with severe undernutrition dropped to 42.8% after one month, compared to 84.3% before ($p=0.000$). These findings align with those reported by Eom et al. [15]. Several studies have shown that relieving symptoms like jaundice and pruritus, and improving nutritional status through biliary decompression, significantly enhance patients' quality of life across physical, emotional, and functional domains [5, 16, 17]. Our findings echo these observations, demonstrating a marked improvement in all quality of life factors assessed in our sample of previously exhausted patients. Similar positive outcomes were reported by Gamanagatti et al. in patients undergoing drainage for distal malignant obstruction [18], and by Barkay et al., who observed significant improvements at both 30 and 180 days post-drainage [19]. These findings collectively support the notion that endoscopic biliary drainage plays a crucial role in improving the overall well-being of patients with malignant biliary stenosis. Our findings convincingly demonstrate the substantial benefits of endoscopic biliary drainage in patients with malignant biliary stenosis. Following prosthesis placement, all patients experienced a remarkable reduction in total bilirubin levels, effectively restoring bile flow.

Table 1. Patients characteristics

Variables		Prcentage (%)	Mean	SD
Age		-	59.23	13
Sex	**Female**	42.9	-	-
	Male	57.1	-	-
Tumor type	**Pancreatic cancer**	34.3	-	-
	Extrahepatic cholangiocarcinoma	44.3	-	-
	Metastasis	10	-	-
	Ampullome	1.4	-	-

Table 2. Comparison of nutritional parameters in pre- and post-endoscopic biliary drainage

Parameters		Before endoscopic biliary drainage (Mean ± Standard deviation)	After endoscopic biliary drainage (Mean ± Standard deviation)	*P value*
Height (cm)		169 cm±6.3	-	
Weight (kg)		53.03kg±9.85	57.4kg±10.03	0.000
BMI (kg/m^2)		18.06kg/m^2±3.65	19.8kg/m^2±3.63	0.000
NRI	**Severe undernutrition**	59 (84.3%)	30 (42.8%)	0.000
	Moderate undernutrition	11 (15.7%)	34 (48.5%)	
	Normal	0 (0%)	6 (8.5%)	
Vomiting	**Daily**	21 (30%)	1 (1.4%)	0.000
	Occasional	42 (60%)	10 (14.3%)	
	Absent	7 (10%)	(84.3%)	

Table 3. Comparison of biological parameters in pre- and post-endoscopic biliary drainage

Parameters	Before endoscopic biliary drainage (Mean ± Standard deviation)	After endoscopic biliary drainage (Mean ± Standard deviation)	P value
Albumin (ALB g/l)	28.32±4.27	32.59±5.38	0.000
Bilirubin (BLT mg/l)	217.04±110.9	25.28±20.1	0.000
C-reactive protein (CRP mg/l)	52.56±59.1	29±26.06	0.003

This significant improvement translated into tangible clinical benefits, leading to the complete resolution of complications like jaundice and pruritus. Furthermore, the positive impact extended to nutritional status. Patients reported a significant decrease in vomiting frequency, accompanied by a notable increase in body weight after one month. This improvement was mirrored in key biological parameters. Albumin levels rose to reach a normal average, indicating enhanced protein synthesis and nutritional recovery. Additionally, C-reactive protein (CRP) levels exhibited a significant decline, suggesting reduced inflammation. Collectively, these findings highlight the multifaceted benefits of endoscopic biliary drainage in this patient population. By addressing the underlying biliary obstruction, the procedure effectively alleviates various complications, promotes nutritional recovery, and potentially improves overall quality of life. The results of our study, which is retrospective, may not be generalizable to other populations or time periods, as fluctuations that may occur in patients' diets could unbalance the biological findings, so future investigations should be longitudinal following patients over long periods exceeding one month after surgery.

4. Conclusions

Endoscopic biliary drainage (EBD), a cornerstone of palliative care for patients with cancerous bile duct narrowing (tumoral biliary stenosis), offers a minimally invasive solution to alleviate obstruction. This technique involves strategically placing a prosthetic stent within the bile duct, effectively re-establishing bile flow. Numerous studies, including this one, have robustly confirmed the efficacy of EBD, emphasizing its multifaceted benefits. Notably, EBD has been shown to improve patients' nutritional status and overall quality of life, offering significant relief and support during their illness.

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