



Management of proximal migrated biliary stents: Single center experience

Proksimale migrate biliyer plastik stentlerin yönetimi: Tek merkez deneyimi

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Background and Aims: Migration in biliary stents is one of the expected complications of biliary stenting. Since proximally migrated biliary stents may result in serious complications, management of proximally migrated biliary stents are important. In this study we aimed to evaluate our patients with proximally migrated biliary stents and review current medical literature. **Materials and Methods:** Patients with proximally migrated biliary stents who had endoscopic retrograde cholangiopancreatography application at Health Sciences University, Adana City Training and Research Hospital, Department of Gastroenterology between September 2017- November 2022 were included in the study. Patients' files and electronic database of our hospital were screened and evaluated retrospectively. Patients' clinic and laboratory data were recorded. **Results:** The study included 57 patients. Mean age was 60.7 ± 14.5 (29-90) and 30 (52.6%) were male. Thirty four patients were asymptomatic other remaining patients presented with abdominal pain, jaundice, or fever. Fifteen (26.3%) patients had cholangitis and five patients had liver abscess during presentation. One patient died due to cholangitis associated with proximally migrated biliary stents. In 31 patients, proximally migrated biliary stents were removed successfully in our hospital. After stent removal, two patients had post-endoscopic retrograde cholangiopancreatography complications (post-endoscopic retrograde cholangiopancreatography pancreatitis and bleeding). Four patients had surgical intervention. In nine patients, stents were removed in external centers. In 13 patients, proximally migrated biliary stents could not be extracted. **Conclusions:** Proximal migration of biliary stents is an important complication of biliary stenting. Patients may be asymptomatic or symptomatic. Proximally migrated biliary stents may result in serious complications such as cholangitis, liver abscess and even death. Thus, early diagnosis and proper treatment are important in these patients. Proximally migrated biliary stents may be removed in most patients with endoscopic retrograde cholangiopancreatography.

Key words: Biliary stent, proximal migration, treatment

Giriş ve Amaç: Biliyer stentlerin migrasyonu beklenmeyen komplikasyonlardan biridir. Proksimale migre olan stentler ciddi komplikasyonlara yol açabileceğinden, yönetimleri önemlidir. Bu çalışmada proksimale migre stent saptadığımız hastalarımızı değerlendirmek ve güncel medikal literatürü gözden geçirmeyi amaçladık. **Gereç ve Yöntem:** Eylül 2017-Kasım 2022 tarihleri arasında Sağlık Bilimleri Üniversitesi Adana Şehir Eğitim ve Araştırma Hastanesinde endoskopik retrograd kolanjiopankreatografi işlemi yapılan hastalar çalışmaya alındı. Hastaların dosyaları ve hastane veri tabanı retrospektif olarak tarandı. Hastaların klinik ve laboratuvar verileri kaydedildi. **Bulgular:** Çalışmaya 57 hasta alındı. Ortalama yaş 60.7 ± 14.5 (29-90) ve 30 (52.6%) hasta erkek idi. Otuz dört hasta başvuru anında asemptomatik, diğer hastalarda ise karın ağrısı, sarılık veya ateş şikayetleri vardı. On beş (%26.3) hastada kolanjit ve beş hastada başvuru sırasında karaciğer apsesi mevcuttu. Bir hasta proksimale migre stent ile ilişkili kolanjit nedeniyle hayatını kaybetti. Otuz bir hastada proksimale migre stentler hastanemizde başarılı bir şekilde çıkarıldı. Stent çıkarılması sonrası iki hastada endoskopik retrograd kolanjiopankreatografi işlemi sonrası komplikasyon gelişti (Bir hastada post endoskopik retrograd kolanjiopankreatografi pankreatiti ve bir hastada kanama). Dört hastada cerrahi girişim yapıldı. Dokuz hastada migre olmuş stentler dış merkezde çıkarıldı. On üç hastada migre olmuş stentler çıkarılamadı. **Sonuç:** Proksimale migre olmuş biliyer stentler biliyer stentlerin önemli bir komplikasyonudur. Hastalar semptomatik veya asemptomatik olabilir. Proksimale migre olmuş biliyer stentler kolanjit, karaciğer apsesi ve hatta ölüme bile yol açabilirler. Bu nedenle erken tanı ve uygun tedavi önemlidir. Proksimale migre olmuş biliyer stentler endoskopik retrograd kolanjiopankreatografi işlemi ile çıkarılabilirler.

Anahtar kelimeler: Biliyer stent, proksimal migrasyon, tedavi

INTRODUCTION

Biliary stents have been successfully and frequently applied modality to treat biliary obstructions and strictures for more than 40 years (1). Application of biliary stent in therapeutic endoscopic retrograde cholangiopancreatography (ERCP) is a great advance and revolution in the treatment of biliary diseases (2). Biliary stents are used to treat biliary obstructions which were caused by unextractable biliary stones, chronic pancreatitis, anastomotic strictures related to liver transplantation, benign biliary strictures after cholecystectomy, cholangiocarcinoma, pancreas cancer or other malign extrahepatic diseases and biliary stents were also used to treat postoperative biliary leaks (2,3). Indications of the procedure, selection of proper stent type, contraindications, complications, and management of complications must be known prior to biliary stenting (3). Complications of biliary stents are stent occlusion, stent migration, cholangitis, cholecystitis, perforation, and bleeding (4). Biliary stent migration is one of frequent complications of biliary stents (3,5). There are various reports with different results regarding the frequency of stent migration, risk factors and migration type (proximal or distal) in medical literature (3,5,6). Early diagnosis and proper treatment are important. ERCP is preferred treatment modality in the treatment of proximally migrated biliary stents (PMBS).

In this study we aimed to evaluate our patients with proximally migrated biliary stents and review current medical literature.

MATERIALS and METHODS

The Study was conducted in University of Health Sciences, Adana City Training and Research Hospital through a time frame of September 2017 and November 2022 and included consecutive patients with diagnosed with PMBS during ERCP.

Patients' presentations, demographics, indications for biliary stenting, time to migration, place where stent was placed, success of endoscopic treatment or other treatment modalities, complications of applied modality, laboratory data when migration was detected were recorded retrospectively.

Diagnosis of biliary stent migration was made if the stent was not seen through papillary orifice and fluoroscopic image of stent in biliary tract.

Retrieval of stent were defined as observation of stent removal after applied treatment modality in ERCP and no stent image on fluoroscopy. Failure of procedure was defined as failure to remove stent by stone extraction balloon, dormia basket, forceps, or snare.

Patients with lack data, metal or pig tail stent were excluded.

The study was approved by local ethic committee of Adana City Training and Research Hospital with decision no: 2023/2383.

This study was conducted in accordance with the principles of the Declaration of Helsinki.

Statistics

Statistical analysis was done using Statistical Package for the Social Sciences (SPSS) version 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). Continuous variables were expressed as mean \pm standard deviation (SD) and categorical variables were expressed as frequency and percent [n (%)].

RESULTS

Six thousand one hundred fifty-two ERCP procedures were performed in our unit through September 2017-November 2022. Among them 57 patients had proximal migration of stent and were included in the study. Mean age was 60.7 ± 14.5 (29-90) and 30 (52.6%) were male. The most common indications of biliary stenting were choledocholit-

hiasis, benign biliary strictures and biliary leaks, respectively. In 38 (66.7%) patients, stents were placed in our hospital and in 19 (33.3%) patients' stents were placed in other hospital. Thirty-four patients were asymptomatic other remaining pa-

tients presented with abdominal pain, jaundice, or fever. Fifteen (26.3%) patients had cholangitis and 5 (8.8%) patients had liver abscess during presentation. Stents were migrated into choledochus in 52 patients, into intrahepatic bile ducts in 3 patients and into main hepatic duct in 2 patients. In 31 (54.3%) patients, PMBS were removed successfully in our hospital. Of these patients 27 (47.4%) patients PMBS retrieved in first ERCP procedure while four of them needed repeated ERCP procedures (three patients in 2 sessions and one patient needed 4 sessions). The most common treatment modality was balloon. Two patients had post-ERCP complications (post ERCP pancreatitis and bleeding). Four patients had surgical intervention. In 9 patients, stents were removed in external centers. All migrated stents in other locations except choledochus (5 patients %8.7) were successfully removed. In 13 patients stent could not be extracted. Four of them had pancreas carcinoma, 2 of them and 5 others died during follow up unrelated to stent migration. Only one patient died related to PMBS associated cholangitis. Five patients had lost to follow-up. Patient demographics, stent indications, place stent placed, properties of stent and applied treatments are shown on Table 1. Patients' laboratory data are shown on Table 2.

Table 1 Patient demographics, stent indications, stent placement site, properties of stent and applied treatments.

Age (years old)	60.7 ± 14.5 (29-90)
Sex (Male/Female)	30/27
Stent Indication	
Choledocholithiasis	39 (68.4%)
Benign biliary strictures	3 (5.3%)
Biliary leaks	5 (8.8%)
Pancreas Ca	4 (7%)
Cholangiocarcinoma	1 (1.8%)
Other	5 (8.8%)
Time to stent migration (Months)	13.7 ± 18.8 (1-67)
Presentation	
Asymptomatic	34 (59.6%)
Abdominal pain	20 (35.1%)
Jaundice	8 (14%)
Fever	6 (10.5%)
Cholangitis	
Present	15 (26.3%)
Absent	42 (73.7%)
Liver abscess	
Present	5 (8.8%)
Absent	52 (91.3%)
Applied treatment n (%)	
Balloon	28 (49.1%)
Basket	2 (3.5%)
Forceps	1 (1.8%)
Surgical intervention	4 (7%)
External center	9 (15.8%)
Failed extraction	13 (22.8%)
Stent removal at first ERCP	
Yes	27 (47.4%)
No	4 (7%)
Procedure related complications	
Bleeding	1 (1.8%)
Pancreatitis	1 (1.8%)

DISCUSSION

Nowadays, endoscopic biliary stenting by ERCP in the management of biliary obstructions caused by various etiologies is frequently used modality (4). There are various stent types exist. Plastic stents are widely used, with advantages of low cost, ease of replacement and its usability for benign diseases (3). The plastic stents have flaps close to each end to prevent migration, but unfortunately these flaps may not prevent proximal or distal migration. Proximal migration is a relatively rare complication and may result in serious situations such as cholangitis and liver abscess (7).

Table 2 Patient's laboratory data at presentation.

WBC ($10^3/\mu\text{l}$)	10.50 \pm 5.93 (3.8 - 38.9)
Hb (g/dL)	12.55 \pm 1.9 (8.2 - 16.5)
PLT ($10^3/\mu\text{l}$)	270.36 \pm 106.45 (97 - 532)
INR	1.05 \pm 0.11 (0.89 - 1.3)
Glucose (mg/dl)	129.5 \pm 51.3 (75 - 300)
AST (U/L)	77.6 \pm 146.6 (15 - 717)
ALT (U/L)	60.1 \pm 92.6 (8 - 432)
ALP (U/L)	213.8 \pm 201.4 (44 - 890)
GGT (U/L)	204.7 \pm 208.1 (13 - 1027)
Alb (g/L)	35.3 \pm 6.8 (20.9 - 44.7)
T. Bil (mg/dL)	1.66 \pm 2.5 (0.3 - 17.2)
D. Bil (mg/dl)	0.7 \pm 1.5 (0.1 - 9.4)
Urea (mg/dL)	35.96 \pm 23.9 (9.3 - 165)
Cr (mg/dL)	0.9 \pm 0.9 (0.37 - 7.27)
Na (mmol/L)	138.4 \pm 3.5 (128 - 148)
K (mmol/L)	4.5 \pm 0.5 (3.54 - 5.62)
CRP (mg/L)	58.42 \pm 90.1 (0. - 358)

The frequency of proximal migration of stents into the bile duct has been reported to be 1.7 - 10% (8-10). Since patients who were stented in other centers, and we cannot give exact stent migration rate in our study.

In a study by Taj et al, included 5700 ERCP procedures performed on 4800 patients, 1229 patients (21.6%) had biliary stenting. Choledocholithiasis was the most common indication for biliary stenting. In 51 patients (4.16%) stent migration occurred and 39 of them (76.4%) stents were migrated proximally. All patients were successfully treated by ERCP, in 45 (88.2%) patients stents were removed in first session and in 6 (11.8%) patients needed repeated sessions. There was no complication related to the procedure (11). In a study by Katsinelos et al, included 51 patients, reported that in 21 patients (41.2%) biliary stents migrated proximally while in 30 patients (58.8%) biliary stents were migrated distally. Fifteen out of 21 patients

(71.4%), proximally migrated stents were successfully removed by ERCP (12).

In a study by Arhan et al, stent migration was observed in 45 (8.58%) out of 524 biliary stent placements. Twenty four (53.3%) of them were PMBS. All PMBS were successfully removed using stone extraction balloon \pm biopsy forceps (5).

The mechanism for the migration of biliary stents is not clear. Studies reported that patient, endoscopic, or stent related factors may predispose to stent migration. Benign etiology, common bile duct dilation, prior sphincterotomy, stenosis and location of stenosis, type of stent, length and diameter, duration of stent, biliary dilatation are defined risk factors for MBS (6,6,13). However, presence of multiple stent placement has decreased the risk of proximal stent migration (5).

Patients with PMBS may present as asymptomatic or symptomatic such as jaundice, abdominal pain, fever, nausea, and vomiting. Migrated biliary stents may result in serious complications. Some patients may present with cholangitis or liver abscess (11). In our study 34 (58.6%) of patients were asymptomatic, 21 (36.2%) of patients had abdominal pain, 8 (13.8%) of patients had jaundice and 6 (10.3%) of patients had fever during admission to our hospital. Sixteen (27.6%) of our patients had cholangitis and 5 (8.6%) of our patients had liver abscess during presentation.

Diagnosis of PMBS often was made if the stent was not seen through papillary orifice and fluoroscopic image of stent in biliary tract (6). Diagnosis of migrated biliary stents may also be made by direct graphy, computed tomography, magnetic resonance, or magnetic resonance cholangiopancreatography.

Early diagnosis and proper treatment of PMBS are important. Stents may be retrieved by ERCP, interventional radiologic techniques or surgery. If ERCP failed to remove PMBS, in this situation,

stent removal may be performed by interventional radiologic techniques or surgical methods which are more invasive (10,12,14).

ERCP is first line treatment modality to remove PMBS (5,11,15). The experience of the endoscopist and the presence of equipment to be used in stent removal as well as patient-related factors (i.e., biliary dilatation, strictures, depth of stent migration, distal stent impaction) are important in the choice of retrieval technique for the treatment of PMBS (15).

Numerous techniques to retrieve a PMBS have been described. Commonly used endoscopic devices include stone extraction balloon, baskets, forceps, snares, and Soehendra stent retriever (5,6,10,11,14). Most or all PMBS can be retrieved endoscopically by using these devices (5,6,11,14). The placement of an additional stent alongside an irretrievable stent is a satisfactory alternative to retrieval (15). To choose proper treatment method, some factors should be considered. In patients with advanced biliary dilatation, stone extraction balloon may fail to extract PMBS, in these patients, basket may be another option, while using rat tooth forceps, forceps may harm bile duct wall and may cause bleeding and bile duct damage. To prevent damage to bile duct wall, procedure must be performed under fluoroscopy when using forceps. In case of failure with balloon or basket, balloon biliary sphincteroplasty may help to increase the success rate (16). Rarely, cholangioscopy can be used to remove PMBS (17,18). However, cholangioscopy is not available even in many experienced centers.

In our study, in 27 (47.4%) of our patients' migrated stents were extracted in first ERCP procedure, 4 (7%) of patients needed repeated ERCP procedures (3 patients in 2 sessions and one patient needed 4 sessions). Twenty-eight (49.1%), 2 (3.5%), and one (1.75%) patient were treated with balloon,

basket, and biopsy forceps, respectively. Four (7%) patients were treated with surgical intervention. In 9 patients, stents were removed in external centers. In 13 out of 52 patients who had PMBS in ductus choledochus, PMBS could not be extracted, and another stent was placed. Of these patients 7 patients died during follow-up unrelated to PMBS and only one patient died related to cholangitis. Five patients had lost to follow-up.

In our study we have observed migrated stents in locations other than ductus choledochus in 5 patients. In 4 patients (7%) stents were successfully retrieved by ERCP. In only one patient who had migrated stent into intrahepatic bile duct, stent could not be retrieved and required surgical treatment. We think that due to low number of our cases, it would not be appropriate to comment on the effect of stent location to stent removal.

The rate of occurrence of successful endoscopic retrieval of a PMBS has been reported as 71.4-100% (5,12). In our study success rate of stent removal was low (54.47% in our center, 70% if we include external centers). Low success rates may be related with lack of stent removal tool, lack of large balloon application, lack of cholangioscope, inexperienced endoscopists and failure to follow up patients during pandemics. Twenty six (45.6%) of our patients were diagnosed during pandemics. In our study, since some ERCP procedures were performed in external center, lack of long-term follow-up of some patients who had biliary stenting in our hospital, we could not give the exact rate of PMBS.

Limitations of our study are retrospective study and single-center design. Another restriction of our study is lack of balloon sphincteroplasty, lack of the use of Soehendra stent retriever and cholangioscopy, which may lead to low success rate of PMBS removal.

In conclusion, PMBS are one of the important complications that may be seen in patients with

biliary stent placement. PMBS's may be removed endoscopically in most patients. Advanced ERCP methods in stent removal should be known if the stent cannot be removed, we think that in case of failed stent removal attempts, placement of a new stent and referral of patients to more experienced centers may be appropriate way.

Ethics Committee: This study protocol was ap-

proved by *Ethics Committee of Adana City Training and Research Hospital with decision no: 2383 dated 02.02.2023. The study was complied with The World Medical Association Declaration of Helsinki.*

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