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Comparison of coagulation and cutting sphincterotomies with respect to clinical complications

Endoskopik sfinkterotomi sırasında kullanılan akım tiplerinin klinik komplikasyonlar ve laboratuvar testlerine etkisi

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Background/aims: *It is known that the coagulation current causes more pancreatitis and less bleeding compared to the cutting current during sphincterotomy. The aim of this study was to identify the difference between clinical and laboratory effects of coagulation and cutting sphincterotomy.* ***Methods:*** *A total of 87 patients admitted to our department were evaluated, with symptoms and laboratory values prior to and 24 hours following the procedure, features of endoscopic intervention and complications related to the procedure being systematically recorded for each patient.* ***Results:*** *In 43 patients (30 men, 13 female) with a mean age of 55.5 ± 17 (range 22-89) years, sphincterotomy was performed by cutting current and in 44 patients (22 men, 22 female) with a mean age of 56.3 ± 15 (range 21-66) years, it was performed by coagulation current. There was no significant difference between the two groups according to mean AST, alkaline phosphatase, total bilirubin and amylase values either before or after the procedure. Mean amylase values increased significantly both in the cut group and the coagulation group after procedure (75 ± 17 vs 180 ± 60, p<0.01; 102 ± 15 vs 228 ± 51, p<0.01 respectively). There was no significant difference between the two groups according to sphincterotomy indication, the number of patients with precut sphincterotomy, mean amount of contrast agent and number of patients with pancreatic acinarisation. There was also no significant difference between the two groups according to the number of patients with pancreatitis (cut=five, coagulation=seven) or cholangitis (cut=two, coagulation=one) related to the procedure. Bleeding requiring sclerotherapy or blood transfusion did not occur in any patient.* ***Conclusion:*** *No significant difference was found between cut and coagulation sphincterotomy regarding development of complications and it is therefore considered that the endoscopists' preference may appropriately determine choice of current during sphincterotomy.*

Key words: ERCP, Endoscopic sphincterotomy.

Amaç: *Koagulasyon akımının kesi akımına oranla daha fazla pankreatit gelişimine ve daha az kanamaya neden olması beklenir. Çalışmamızın amaçı kesi sfinkterotomisi ile coagulation sfinkterotmisinin klinik ve laboratuvar farklılıklarını belirlemekti.* ***Yöntem:*** *Kliniğimize başvuran toplam 87 hasta değerlendirilmiştir. Her olguda işlem öncesi ve 24 saat sonrası semptomları, laboratuvar değerleri, ERCP bulguları ve komplikasyonları sistematik olarak kaydedilmiştir. Kliniğimizde yaş ortalaması 55.5±17 (22-89) yıl olan 43 hastaya (30 erkek, 13 kadın) kesi akımı ile ve yaş ortalaması 56.3±15 (21-60) yıl olan 44 hastaya (22 erkek) koagulasyon akımı ile sfinkterotomi uygulandı.* ***Bulgular:*** *İki grubun işlem öncesi ve işlem sonrası ortalama AST, alkalen fosfataz, total bilirubin ve amilaz değerleri arasında anlamlı fark yoktu. Iki gruptaki sfinkterotomi endikasyonu, precut sfinkterotomi yapılan hasta sayısı, verilen ortalama kontrast madde miktarı, pankreas asinarezasyonu olan hasta sayısı ve yapılan tedavi bakımından iki grup arasında anlamlı fark yoktu. Hem kesi grubunda hem de koagulasyon grubunda işlem sonrası ortalama amilaz değerleri işlem öncesine göre anlamlı olarak yüksekti (sıra ile 75±17 vs 180±60, p<0.01, 102±15 vs 228±51, p<0.01). Ancak işlem sonrası akut pankreatit (kesi=5, koagulasyon=7) ve akut kolanjit gelişen (kesi=1, koagulasyon=1) hasta sayısı bakımından da iki grup arasında anlamlı fark yoktu. İşem sırasında hiçbir vakada skleroterapi veya kan transfüzyonu gerektirecek kanama gelişmedi.* ***Sonuç:*** *Kesi ve koagulasyon sfinkterotomileri arasında komplikasyon gelişimi bakımından anlamlı bir fark saptanamadı. Sfinkterotomi sırasında bunlardan hangisinin kullanılacağı endoskopistin tercihine bağlıdır.*

Anahtar kelimeler: ERCP, endoskopik sphinkterotomi.

INTRODUCTION

Endoscopic sphincterotomy may cause complications such as acute pancreatitis, bleeding, cholangitis and retroduodenal perforation (1,2) and the overall rate of complications from the procedure takes into account a broad spectrum of patients, indications, and endoscopists (3,4). Presence of sphincter of Oddi's dysfunction difficult cannulation of the bile duct, over injection of contrast matter into the pancreatic duct (5) and pre-cut sphincterotomy (5,6) are important factors in the development of procedure related complications.

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Electrosurgery relies on heat generated in tissue by passage of high-frequency alternating currents. Coagulation current consists of intermittent high-voltage pulses that are able to pass desiccated tissue to cause a thermal effect over a wide area. Cutting current is a continuous current that has too low a voltage to pass desiccated tissue and does not heat as extensively (7,8). Theoretically, the wider area of damage caused by coagulation current may lead to greater post-procedure pancreatitis.

In contrast to electrocutting the temperature rise in the tissue by high frequency electric current in electrocoagulation is gradual enough for the intra- and extracellular fluid to evaporate and thereby permit tissue shrinkage. In this fashion, cut blood vessels can be shrunk so blood ceases to flow, coagulation thus being achieved (7). It is therefore expected that more bleeding occurs in the use of Coagulation current than Cut current. In a previous prospective study, it was reported that Cut current alone causes more procedure related pancreatitis than Coagulation plus Cut current (8).

The aim of this study was to compare the effects and complication rates of Cut and Coagulation currents used during sphincterotomy.

MATERIALS AND METHODS

All patients undergoing endoscopic sphincterotomy between January 1998 and January 2000 were randomized to either a Cut or Coagulation current procedure. Patients undergoing sphincterotomy on even calendar dates received the Cut current whereas patients undergoing sphincterotomy on odd calendar dates received Coagulation current. Clinical history, physical examination, laboratory values including AST, alkaline phosphatase, total bilirubin, and amylase in addition to all information about endoscopic retrograde cholangiopancreaticography (ERCP) and sphincterotomy procedure were recorded systematically.

Endoscopic intervention

Seven experienced gastroenterologists performed the ERCP procedure. A sphincterotomy was performed at the endoscopists' discretion for stone removal or to introduce a stent to the biliary ducts according to clinical, laboratory and cholangiographic findings of patients. The valleylab electrosurgical unit (model Force 2, Valleylab, Boulder, Colo.) was used at a setting of Cut current with a power setting of 35 watts/sec and Coagulation current at a power setting of 35 watts/sec. Contrast matter containing iodine (urografin) was used to observe the biliary ducts. Persistent bleeding at the time of procedure was endoscopiycally treated by injection of 1:100 dilution of polidocanol.

After each procedure, the endoscopist estimated blood loss as one of the following: none or less than 25 ml (mild bleeding), 25-50 ml (moderate bleeding) and more than 50 ml (severe bleeding).

Clinical follow up of patients

Prior to and 24 hours after the procedure, all patients were evaluated by the same physician and a blood sample was taken to determine serum AST, alkaline phosphatase, total bilirubin and amylase levels. Clinical features considered to be consistent with acute cholangitis caused by procedure were pyrexia above 38^0C (after the exclusion a of possible infection source) with or without abdominal pain, nausea, vomiting and laboratory findings of cholestasis. Clinical features considered to be consistent with acute pancreatitis were epigastric pain persisting for at least 24 hours and serum amylase more than three times the upper normal limit.

Ciprofloxacin 500 mg BID was given prior to and for three days after the procedure in all patients to prevent possible acute cholangitis. Patients without clinical and laboratory follow up either before or the after procedure were excluded from the study.

Statistics

Data were expressed as mean ± SE or number of patients (proportion). The significance of differences of continuous variables was assessed using the nonparametric Mann-Whitney U test and Fischer's Exact test. The difference of age between groups was assessed using 't' test.

RESULTS

A total of 92 patients who underwent endoscopic sphincterotomy were included in the study but five of them were later excluded due to lack of amylase levels 24 hours after the procedure. The remaining 87 patients included 35 males and 52 females. In the Cut group, there were 43 patients including 30 males and 13 females with a mean age of 55.5 ± 16.5 (range 22-89) years. In the Coagulation group, there were 44 patients including 22 males and 22 females with a mean age of 56.3 ± 15 (range 21-60) years. There was no sig-

Table 1. Serum AST, alkaline phospahatase, total bilirubin, and amylase level before and 24 hours after sphincterotomy.

	Cut group		***Coagulation group***	
	Before	*After*	*Before*	*After*
AST (U/L)	63 ± 9	80 ± 13	65 ± 8	71 ± 10
Alkaline phosphatase (U/L)	336 ± 48	357 ± 46	381 ± 55	427 ± 71
Total bilirubin (mg/dl)	4.6 ± 1.1	4.6 ± 1.1	4.8 ± 1.1	4.2 ± 1.1
Amylase (U/L)	75 ± 17	180 ± 60	102 ± 15	228 ± 51

Value: Mean ± SD

nificant difference between the two groups according to age and gender.

In the Cut group, four patients had non-insulin dependent diabetes mellitus and one patients a history of acute biliary pancreatitis. In the Coagulation group, three patients had non-insulin dependent diabetes mellitus, one patient had peritonitis carcinomatosa, one acute cholecystitis and 1 acute biliary pancreatitis.

Laboratory findings

Table 1 summarizes laboratory findings of the two groups before and after sphincterotomy.

In the Cut group, there was no significant difference between mean AST, alkaline phosphatase and total bilirubin values before and 24 hours after sphincterotomy. Twenty four hours after sphincterotomy, mean amylase values were significantly higher than before sphincterotomy ($p<0.01$). After sphincterotomy, amylase values compared to the upper limit of normal increased one to three fold in 10 patients and three fold in five patients. After sphincterotomy, amylase values decreased to below the upper limit of normal in the patient whose amylase had been seven fold more than the upper limit of normal before sphincterotomy.

In the Coagulation group, there was no significant difference between mean AST, alkaline phosphatase, and total bilirubin values before and 24 hours after sphincterotomy. Twenty four hours after sphincterotomy, mean amylase values were significantly higher than before sphincterotomy ($p<0.01$). After sphincterotomy, amylase values compared to the upper limit of normal increased one to three fold in 15 patients, and more than three fold in seven patients (22 patients; 50 %). Amylase values after sphincterotomy decreased to half of that before sphincterotomy.

There was no significant difference between the two groups before or after sphinctreotomy according to AST, alkaline phosphatase and total bilirubin values.

Endoscopic features

Table 2 summarizes the endoscopic features of both groups. Precut sphincterotomy was performed in 10 (11 %) patients, selective cannulation of the biliary tract was performed in 49 (56 %) patients, and both the biliary tract and pancreatic canal were seen in 38 (44%) patients. Pancreatic acinarization was found in three of 38 (8%) patients whose pancreatic canal was seen. Sphincterotomy was performed in the 68 (78 %) patients with a biliary stone, the 11 (13 %) patients with cholangiocellular carcinoma, the

Table 2. Indication for sphincterotomy and treatment.

Features of ERCP	*Cut group (%)*	*Coagulation group (%)*
Parapapillar diverticulum	0	2
Precut sphincterotomy	5	5
Pancreatic duct visualization†	12 (28 %)	26(59 %)
Pancreatic acinarization	1	2
Diagnosis		
Biliary stone	33 (77)	35 (80)
Cholangiocarcinoma	8 (19)	3 (7)
Hydatid cyst	1 (2)	1 (2)
Unusual disease	1 (2)	5 (11)
Treatment		
Sphincterotomy	7 (16)	9 (20)
Balloon	23 (53)	21 (47)
Balloon + basket	9 (21)	13 (30)
Stent placement	4 (9)	1 (13)

Table 3. Features of patients with more than three times the upper normal limit after sphincterotomy.

No	*Current*	*'Precut'*	*Pan. duct*	*Ascinarization*	*Amylase-0*	*Amylase-1*	*Pain*
1	Cut	0	0	0	45	821	1
2	Cut	0	0	0	58	760	0
3	Cut	0	0	0	100	2435	0
4	Cut	0	0	0	28	290	1
5	Cut	0	1	1	199	586	0
6	Coagulation	0	0	0	142	617	1
7	Coagulation	1	1	1	111	1657	0
8	Coagulation	0	1	0	78	961	1
9	Coagulation	0	1	0	82	758	0
10	Coagulation	0	1	0	108	1325	1
11	Coagulation	0	1	0	58	315	0
12	Coagulation	0	1	0	45	170	0

Abbreviations: Current: Electrical current used during sphincterotomy; 'precut': precut sphincterotomy; pan. duct: observation of pancreatic duct during ERCP; asinerizasyon: acinarization of pancreas during pancreaticography; amylase-0: amylase value before procedure (U/L); amylase-1: amylase value after procedure; pain: abdominal pain after procedure ('0': negative, '1': positive).

two (2 %) with hydatid cyst and the six (7 %) with rare disease disease.

In the Cut group, 21 ± 1 ml of contrast matter was injected during the procedure. The most common indication for sphincterotomy was biliary stone in the common bile duct and the most common therapeutic procedure was stone removal by balloon. In nine patients, however, large stones were removed from the biliary tract using both balloon and basket. In the four patients with cholangiocarcinoma a stent was placed (three metal and one plastic) into the biliary tract after sphincterotomy. Sphincterotomy only performed on seven patients, including four with a biliary stone, one with a hydatid cyst, and two with cholangiocarcinoma causing incomplete obstruction of biliary flow.

In the Coagulation group, 25±2 ml of contrast matter was injected during the procedure. The most common indication for sphincterotomy was a biliary stone in the common bile duct. Sphincterotomy was performed on three patients with post operative biliary stricture, one patient with fibrosis of Oddi's sphincter and one patient with pancreatic cancer. In the almost half of the patients (47%), the stone was removed by balloon only. Both endoscopic sphincterotomy and percutaneous biliary drainage were carried out on patients with cholangiocarcinoma in the same session. A metalic biliary stent was placed in the patient with pancreatic cancer following sphincterotomy. Sphincterotomy only was carried out on nine patients, including three with a small common bile duct stone, one with a hydatid cyst, one with cholangiocarcinoma, two with post operative benign biliary stricture and one with fibrosis of Oddi's sphincter.

Although there was no significant difference between the two groups according to theraupetic procedure, the number of patients, whose pancreatic canal was seen, higher in the Coagulation group than the Cut group ($p<0.01$).

Complications

A 41-year-old man with cholangiocarcinoma located in the porta hepatis died after sphincterotomy due to septicemia caused by incomplete biliary drainage. Procedure related complications were seen in eight (9 %) patients, five symptomatic pancreatitis (Cut: two; Coagulation: three) and three septicemia.

Serum amylase values were increased more than three fold in 12 patients (Cut: five; Coagulation: seven). Table 3 summarizes clinical, laboratory and endoscopic features of those patients. Precut sphincterotomy was performed in only one patient. The pancreatic canal was seen in seven of 12 (58 %) patients who had a common bile duct

stone. There was no significant difference between the two groups according to the number of patients with increased amylase levels after sphincterotomy. All acute pancreatitis episodes resolved completely with clinical observation and symptomatic treatment.

Minor haemorrhagia was observed in 21 (Cut: nine; Coagulation: 12) patients but this resolved without any intervention. Major haemorrhagie requiring sclerotherapy or blood transfusion was not observed in any patient.

Procedure related cholangitis developed in three (Cut: two; Coagulation: one) patients, all of whom had cholangiocarcinoma and the in whom adequate biliary drainage was not provided during therapeutic intervention. One of those three patients died in spite of intensive antibiotic therapy.

DISCUSSION

Pancreatitis is the most common complication after diagnostic ERCP and sphincterotomy (9,10). Temporary obstruction in the pancreatic duct is an important factor in the development of post-ERCP pancreatititis (5,8). It has been postulated that one of the causes of obstruction in the pancreatic duct is local tissue edema induced by thermal damage developing during sphincterotomy (8). It has previously been shown that bipolar sphincterotomy causes less thermal injury and edema compared to monopolar sphincterotomy and decreases the risk of acute pancreatitis.

In this study, it has been shown that both Cut and Coagulation currents cause significant pancreatic amylase elevation. Most patients are asymptomatic and amylase elevation is less than three times the upper normal limit. There was significant difference between the Cut and Coagulation group according to the number of patients who had symptomatic acute pancreatitis and to mean amylase values. Elta et al. have shown that use of the pure cut current is associated with a lower incidence of pancreatitis compared to blended current sphincterotomy (8). Theoretically, it can be suggested that because thermal tissue injuries induced by Cut sphincterotomy are less than those caused by Coagulation sphincterotomy, tissue edema and pancreatic duct obstruction may also be expected to be less severe during Cut sphincterotomy (7). Thus Coagulation current is expected to increase the risk of development of acute pancreatitis. However, the results of the present study indicate that the type of current used is not an important factor in the development of post ERCP acute pancreatitis.

Sphincter of Oddi dysfunction (5,12), younger age (5,13), precut sphincterotomy, difficulty in achieving biliary cannulation, number of pancreatic contrast injections and pancreatic acinarisation (6) are reported to be important risk factor in the development of post sphincterotomy acute pancreatitis. It was not possible to identify the presence of Oddi dysfunction in our clinic due to lack of manometry. Establishing a diagnosis of Oddi's sphincter dysfunction requires exclusion of other possible causes of biliary disease but in all of our cases, cholangiographically proven causes were identified. Oddi's sphincter dysfunction was there fore not considered in any patient. There was no significant difference between the two groups according to mean age, precut sphincterotomy, amount of contrast matter used during the procedure and pancreatic acinarisation. In the Coagulation group, the number of patients whose pancreatic duct was seen was significantly higher than the 'Cut' group ($p<0.01$), but this difference did not correlate with the mean value of post procedure amylase levels and the number of patients with post procedure acute pancreatitis. In this study, acute pancreatitis developed in seven of 12 patients whose pancreatic duct had been observed and injection of contrast matter into the pancreatic duct thought to be an important factor in the development of pancreatitis.

Presence of coagulopathy (14), choledocholithiasis and active cholangitis before the procedure (5), occurrence of any observed bleeding during the procedure (15), presence of aberrant retroduodenal artery (16), lack of experience of the endoscopist, anticoagulant therapy within three days of the procedure, cirrhosis and periampullary diverticulum (17) were reported to be important factors in the development of procedure related bleeding. In the case of electrocoagulation, the temperature rise in the tissue is gradual enough for the intra- and extracellular fluid to evaporate and thereby permit tissue shrinkage. In this fashion, cut blood vessels can be shrunk so that blood ceases to flow, coagulation thus being achieved. In the case of electrocutting, however, cut blood vessels can not be shrunk so that blood ceases to flow (7) and it is therefore expected that more bleeding occurs during Cut sphincterotomy than

Coagulation sphincterotomy. Elta et al. reported no difference between Cut and Coagulation sphincterotomy in terms of to bleeding (8). In this study, no patients required either sclerotherapy or blood transfusion to control bleeding at the time of sphincterotomy. More bleeding complication were expected in our patients because most of them (79%) had choledocholitiasis. However, the absence of obvious coagulopathy and cirrhosis our endoscopists experience (each endoscopists performed more than three sphincterotomies per week) and the absence of oral anticoagulation therapy may be important factors for the lack of such complications.

Cholangitis and sepsis are important complications seen after biliary procedures and significant risk factors in the development of these complications after the procedure include combined percutaneous-endoscopic procedure, stenting of malignant stricture and failed biliary access or drainage (12,18). Ducreux et al. reported that a stent should not be placed in the case of cholangiocarcinoma located at the porta hepatis because of the high mortality rate within 30 days of the procedure (19). In our study, three patients (two Cut, one Coagulation) experienced an episode of cholangitis. All of these cases had cholangiocarcinoma and efficient biliary drainage could not be provided after procedure. The patient with cholangiocarcinoma located at the porta hepatis died from septicemia which developed after the procedure. Our findings supported the view that inefficient biliary drainage rather than type of sphincterotomy is an important risk factor in the development of cholangitis.

It has been reported that in patients with acute biliary pancreatitis without obstructive jaundice or biliary sepsis, ERCP and sphincterotomy within 72 hours of the onset of symptoms provided symptomatic relief (20,21) but did not decrease rates of mortality or complications compared to conservative treatment (21). Hammarstrom et al. reported that early endoscopic sphincterotomy decreased the number recurrent acute pancreatitis episode but did not decrease late biliary complications (22). Whatever the etiology of acute pancreatitis, the end result is a local and systemic overproduction of inflamatory mediators (23) and treatment can not reduce those inflamatory mediators (24). Our two cases were asymptomatic and had seven times the upper normal limit of amylase elevation before the procedure. After sphincterotomy, amylase levels of our case with obvious cholestasis caused by cholangiocarcinoma, decreased to normal limits and in another case without obvious cholestasis, amylase levels decreased to 50% of that before the procedure. Hyperamylasemia peaks 90 minutes to four hours after the procedure and resolves within 48 hours (25). Hyperamylasemia in our patients may therefore have resolved spontaneously or be related to the beneficial effect of early sphincterotomy on acute pancreatitis. However, these results are not meaningful due to the small number of cases.

In conclusion, no difference was found between the use of Cut and Coagulation current during sphincterotomy in terms of technique or clinical and laboratory effects. The type of current to use may therefore be at the discretion of the endoscopist.

REFERENCES

1. Leese T, Neoptolemos JP, Carr-Locke DL, et al. Successes, failures, early complications and their management following endoscopic sphincterotomy: Results in 394 consecutive patients from a single center. Br J Surg 1985; 72: 215-9.
2. Vaira D, D'anna L, Ainley C, et al. Endoscopic sphincterotomy in 1000 consecutive patients. Lancet 1989; 2: 431-4.
3. Newcomer MK, Jowell PS, Cotton PB, et al. Underestimation of adverse events following ERCP: A prospective 30-day follow-up study [abstract]. Gastrointest Endosc 1995; 41: 408.
4. Ferrari AP, Slivka A, Lichtenstein DR, et al. Factors effecting ERCP complications: looking backwards and forwards [abstract]. Gastrointest Endosc 1994; 40: p20.
5. Freeman ML, Nelson DB, Sherman S, , et al. Complication of endoscopic biliary sphincterotomy. N Engl J Med 1996; 335: 909-18.
6. Taşkın V, Aladağ M, Serbest S, et al. ERCP ve EST'ye yardımcı, güvenli bir işlem: Ön kesi [abstract]. Turk j Gastroenterol 1996; 7:B93.
7. Haag R, Cuschıeri A. Recent advances in high-frequency electrosurgery: development of automated systems. J R Coll Surg Edinb 1993; 38: 354-64.
8. Elta GH, Barnett JL, Wille RT, et al. Pure cut electrocautery current for sphincterotomy causes less post-procedure pancreatitis than blended current. Gastrointest Endosc 1998; 47: 149-53.
9. Sherman S, Lehman GA. ERCP and endoscopic sphincterotomy induced pancreatitis. Pancreas 1991; 6: 350-67.
10 . Sherman S. ERCP and endoscopic sphincterotomy induced pancreatitis Am J Gastroentrol 1994; 89: 303-5.
11. Siegel JH, Veerappan A, Tucker R. Bipolar versus monopolar sphincterotomy: A prospective trial. Am J Gastroenterol 1994; 89: 1827-30.
12. Freeman M, Nelson D, Sherman S, et al. Haemorrhage from endoscopic sphincterotomy: A prospective, multicen-

ter, 30-day study [abstract]. Gastrointest Endosc 1994; 40: p104.

13. Neoptolemos JP, Carr-Locke DL, Kelly KA, et al. Factors affecting the diameters of the common bile ducts and pancreatic duct using endoscpic retrograde cholangiopancretaicography. Hepatogastroenterology 1991; 38: 243-7.
14. Nelson DB, Freeman ML. Major haemorrhage from endoscopic sphincterotomy: risk factors analysis. J Clin Gastroenterol 1994; 19: 283-7.
15. Mellinger JD, Ponsky JL. Bleeding after endoscopic sphincterotomy as an underestimated entity. Surg Gynecol Obstet 1991; 172: 465-9.
16. Cotton PB, Lehman G, Vennes JA, et al. Endoscopic sphincterotomy complications and their management: an attempt at consensus. Gastrointest Endosc 1991; 37: 383-93.
17. Uzun Y, Soykan İ, Çetinkaya H, et al. Periampuller divertikül içi yerleşimli papillada sfinkterotomi. Turk J Gastroenterol 1999; 10: 357-60.
18. Motte S, Deviere J, Dumenceau JM, et al. Risk factors for septicemia following endoscopic biliary stenting. Gastroenterology 1991; 101: 1374-81.
19. Ducreux M, Liguory CI, Lefebvre JF, et al. Management of malignant hilar biliary obstruction by endoscopy: results and prognostic factors. Dig Dis Sci 1992; 37: 778-83.
20. Yılmaz U, Öksüzoğlu G. Akut Akut biliyer pankreatitte endoskopik tedavi [abstract]. Turk J Gastroenterol 1998; 9:12.
21. Folsch UR, Nitsche R, Lutdke R, et al. Erarly ERCP and papillotomy compared with conservative treatment for acute biliary pancreatitis. N Engl J Med 1997; 336: 237-42.
22. Hammarstrom LE, Stridbeck H, Ihse I. Effect of endoscopic sphincterotomy and interval cholecystectomy on late outcome after gallstone pancreatitis. Br J Surg !998; 85:333-6.
23. James N. The role of cytokines in the pathogenesis of acute pancreatitis. Am J Surg 1998; 175: 76-83.
24. Meregener K, Baillic J. Fortnightly review: acute pancreatitis. BMJ 1998; 316:44-8.
25. Testoni PA, Caporuscio S, Bagnolo F, et al. Twenty-four-hour amylase predicting pancreatic reaction after endoscopic sphincterotomy. Endoscopy 1999; 31: 131-6.