Dig Dis Sci (2010) 55:3278–3283
DOI 10.1007/s10620-010-1152-2

ORIGINAL ARTICLE

EUS and ERCP Complication Rates Are Not Increased in Elderly Patients

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Received: 2 November 2009 / Accepted: 3 February 2010 / Published online: 26 February 2010

Abstract
Background Further studies evaluating the safety of advanced endoscopic procedures in elderly patients are needed.
Aim To evaluate the safety of endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound (EUS) in the elderly.
Methods The study population, consisting of 1,000 patients who underwent ERCP or EUS, was divided into two cohorts. The elderly cohort consisted of patients ≥75 years old. The nonelderly cohort consisted of patients <75 years old. The data collected included demographic information, type of procedure completed, procedure medication used, and endoscopic intervention performed. Complications included any event which occurred during the procedure or up to 1 month post procedure.
Results A total of 600 ERCPs and 400 EUS were included. The mean age of the elderly cohort was 80 years (range 75–95 years, $n = 184$) versus 54 years (range 13–74 years, $n = 816$) for the nonelderly cohort. The ERCP complication rate was 10.0% in the elderly versus 10.6% ($P = 1.0$) for the nonelderly. The EUS complication rate was 4.8% in the elderly versus 3.1% in the nonelderly ($P = 0.49$). The overall complication rates were identical at 7.6% ($P = 1.0$). Sedation doses were lower for the elderly cohort ($P < 0.001$). There was a higher rate of procedure bleeding in the elderly cohort ($P = 0.016$).
Conclusion Advanced age is not a contraindication for advanced endoscopic procedures. There is no significant increase in the rate of overall procedure-related complications seen with either ERCP or EUS in elderly patients; however, elderly patients have a higher risk of bleeding. Less procedure-related sedation medication is required for elderly patients.

Keywords Endoscopic retrograde cholangiopancreatography · Endoscopic ultrasound · Elderly · Complication rates

Presented in part as a poster presentation at the 39th Annual Digestive Diseases Week (DDW) meeting in San Diego, CA, May, 2008.

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Introduction

As the median age of the population continues to rise, and the diagnostic and therapeutic roles of endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound (EUS) continue to expand, increasing numbers

of elderly patients are referred for these advanced endoscopic procedures. While the safety of ERCP in elderly, and even extremely elderly, populations has been studied and found to be similar to that in nonelderly patients, these studies have generally been performed with smaller cohorts [1–8]. Given the overall low complication rates of ERCP, a larger sample size may be necessary to elucidate subtle differences between elderly and nonelderly populations. Furthermore, the safety of EUS in the elderly has in general not been well explored.

Better understanding of the comparative risks of these procedures in an elderly population should allow for improved care of these patients with better triage as well as improved postprocedure monitoring and management. The aim of this study is to evaluate the overall complication rates as well as examine specific complication rates for both ERCP and EUS in a larger cohort of elderly patients as compared with a nonelderly cohort undergoing these procedures during the same timeframe.

Methods

We retrospectively reviewed 1,000 consecutive advanced endoscopic procedures completed between 15 January, 2003 and 22 March, 2005 in the ambulatory procedure center at the University of Wisconsin, Madison. There were 600 ERCP ± sphincterotomy and 400 EUS ± fine-needle aspiration (FNA) examinations studied. Rectal ultrasounds were excluded due to their relative decreased risk and invasiveness compared with EUS through the upper gastrointestinal tract. Prior to the procedure, in all cases, written informed consent was obtained from the patient or the patient's next of kin, guardian or designated power of attorney if they were a minor or unable to give consent. The institutional review board at the University of Wisconsin School of Medicine and Public Health approved this study. All advanced endoscopic procedures were completed by, or under the supervision of, four academic, board-certified, experienced therapeutic endoscopists. An advanced endoscopy gastroenterology fellow was involved in a majority of the cases. The procedures were scheduled within 1–2 h time slots starting at 7:30 am and finishing at 4:30 pm, Monday through Friday. The ERCPs were completed using a Pentax ED-3470 or 3270 duodenoscope (Pentax of America, Montvale, NJ). EUS procedures were completed using an Olympus GFUE160 radioechoendoscope or GFUC140 curvilinear echoenodscope (Olympus of America, Inc., Melville, NY). Most procedures were performed under moderate conscious sedation using intravenous fentanyl and midazolam, with promethazine or droperidol used as needed as adjunct sedation. Droperidol use was regulated under an approved section protocol in which a baseline electrocardiogram (EKG) was obtained for all patients, with use only in patients without significant cardiac disease, cardiac dysrhythmia or QTc prolongation. Phenergan was administered as adjunct sedation in patients with prolonged QTc. Phenergan was given in 12.5–25 mg doses diluted in 10 cc normal saline and given over 1 min with confirmation of IV patency prior to administration. As per our endoscopy unit's quality assurance and quality improvement program policies, all of the patients were contacted, by telephone, within 24–48 h of the procedure, as well as 30 days post procedure, to assess for any procedure-related complications. Using this system, very few patients were lost to follow-up within each cohort

The study population consisted of 1,000 patients (mean age 59 years, range 13–95 years; 56% male). The study population was divided into two cohorts. The elderly cohort consisted of patients $\geq$75 years old and included 184 patients. The nonelderly cohort consisted of patients $<$75 years old and had 816 patients.

The data reviewed was collected from procedure reports as well as patients' electronic medical records. The data collected included patient demographic information, type of advanced procedure completed (ERCP or EUS), procedure sedation medication used, and all endoscopic interventions performed. Monitoring of patients during the procedures was per institutional protocol for moderate conscious sedation and included continuous pulse oximetry and telemetry monitoring with blood pressure assessment every 5 min. Complications were defined as any hemodynamic or respiratory compromise during or after the procedure, oversedation requiring reversal medications, pancreatitis, any moderate or severe bleeding, perforation, infection or any signs of infection, abdominal pain, and any event leading to postprocedure hospital admission or death. The timeframe for complications began with the procedure and extended up to 1 month later. The overall, in addition to individual, complications of the advanced endoscopic procedures were compared between the two cohorts.

Statistical Analysis

The primary comparisons were between the elderly and nonelderly cohorts. The primary outcomes analyzed were complications during, as well as within 30 days of, the procedure. The data were compared using either Fisher's test or Student's *t*-test. Statistical significance was considered if the two-sided *P* value was less than 0.05.

Results

A total of 1,000 ERCP and EUS procedures were included and reviewed from 15 January, 2003 to 22 March, 2005.

Table 1 Comparison of overall and specific complication rates, as well as sedation medication doses, between the elderly and nonelderly cohorts

	Elderly (≥75 years)	Nonelderly (<75 years)	*P* value
Number of patients	184	816	
Mean age (range), years	79.8 (75–95)	58.6 (13–74)	
ERCP complication rate	10%	10.6%	1.0
EUS complication rate	4.8%	3.1%	0.49
Overall complication rate	7.6%	7.6%	1.0
Specific complications			
Cardiopulmonary	1.6%	1.1%	0.47
Pancreatitis	0%	1.0%	0.36
Bleeding	3.3%	0.8%	0.02
Perforation	0.5%	0.2%	0.09
Abdominal pain	0%	1.5%	0.14
Infection	0%	1.3%	0.23
Admission/observation	2.7%	1.0%	0.07
Death	0.005%	0%	0.18
Mean procedure medication			
Droperidol	1.4 mg	3.8 mg	<0.001
Fentanyl	172.6 mcg	212.0 mcg	<0.001
Midazolam	5.9 mg	7.8 mg	<0.001

The overall mean age of the patients was 59 years [range 13–95 years, standard deviation (SD) 12.9 years; 56% male]. The mean age of the elderly cohort was 80 years (range 75–95 years, SD 4.7 years; 64% male, 184 patients). The mean age of the nonelderly population was 54 years (range 13–74 years, SD 13.0 years; 54% male, 816 patients). Table 1 summarizes the complications observed within the compared cohorts.

ERCP Complications

There were 600 ERCP ± sphincterotomy reviewed. The study population was 56% male. The most common indication for ERCP was choledocholithiasis (22%) followed by abnormal liver function tests (13%). Other procedure indications included biliary stent change or removal (10%), gallstone pancreatitis (9%), cholangitis (4%), suspected pancreatic neoplasm (4%), and postoperative bile leaks (3%). The remainder of the procedures were completed for less common indications such as primary sclerosing cholangitis with dominant biliary stricture and pancreatic strictures or stones. The overall cannulation rate was 96%. The cannulation rate for the elderly cohort was 97.1%. The cannulation rate for the nonelderly cohort was 95.7% ($P = 0.78$). The overall ERCP complication rate was 10.4%. Within the elderly cohort, the ERCP complication rate was 10.0% and the nonelderly cohort ERCP complication rate was 10.6% ($P = 1.0$). Sphincterotomy was performed in 34% ($n = 201$) of the 600 cases. Sphincterotomies were performed in 33% of the procedures for the nonelderly patients and in 37% of the elderly patient procedures ($P = 0.68$). There was no statistically significant increase in complications in patients in whom sphincterotomy was performed compared with patients in whom sphincterotomy was not performed ($P = 0.13$). Plastic or metal stents were used in 30.1% ($n = 181$) of the cases. Endoscopic biliary or pancreatic dilatation was performed in 9.2% ($n = 55$) of the procedures. Biliary brushings were obtained in 7.4% ($n = 44$) of the procedures. Biliary sphincter manometry was performed in 2.0% ($n = 12$). Overall, there was a significantly higher complication rate among female (14%) compared with male patients (7%; $P = 0.006$). There was no significantly higher complication rate for patients with sphincter of Oddi dysfunction as a procedure indication ($P = 0.11$).

EUS Complications

There were 400 EUS procedures reviewed. The study population was 55% male. The most common indications for EUS were suspected pancreatic pathology (27%) and suspected esophageal pathology (27%). Furthermore, 20% of procedures were for suspected gastric pathology, 6% for suspected biliary pathology, and 5% for suspected ampullary pathology. The remaining EUS procedures were performed for less common indications such as subcarinal abnormalities or duodenal lesions. The overall complication rate was 3.4%. The elderly cohort EUS complication rate was 4.8% and the nonelderly cohort EUS complication rate was 3.1% ($P = 0.49$). FNA was performed in 21% of EUS procedures overall. Within the nonelderly cohort, FNA was performed in 18% of the procedures and, within the elderly cohort, FNA was completed in 25% of the procedures ($P = 0.22$). All EUS complications were associated with FNA. There was a trend toward increased complications among female patients, however, this was not statistically significant ($P = 0.06$).

Overall Complications

The overall advanced procedure complication rate for the elderly cohort was 7.6%, and the overall complication rate for the nonelderly cohort was 7.6% ($P = 1.0$). For the entire population, the overall ERCP complication rate was 10.4%. The overall EUS complication rate was 3.4%. There was one death in the elderly cohort, in a patient who underwent ERCP, and no reported deaths in the nonelderly cohort ($P = 0.18$). The patient who died was an 87-year-old woman who had an ERCP completed for treatment of a bile leak post laparoscopic cholecystectomy. The common

bile duct could not be cannulated during the ERCP; therefore, the patient had a percutaneous cholecystostomy tube (PCT) placed. Twelve hours following PCT placement, the patient suffered cardiopulmonary arrest.

Specific Complications

There was a significantly higher rate of procedure-related bleeding within the elderly cohort (3.3%) compared with the nonelderly cohort (0.8%; $P = 0.016$). Most of the postprocedure bleeding episodes were minor and did not require blood transfusions. There was no significant increase in other specific complications, such as cardiopulmonary compromise, pancreatitis, perforation, abdominal pain, infection, postprocedure admission, or death for the elderly cohort. There was no significant increase in the complication rate among elderly patients undergoing ERCP with sphincterotomy compared with nonelderly patients undergoing ERCP with sphincterotomy ($P = 0.84$). Furthermore, there was no significant increase in the complication rate among elderly patients undergoing EUS with FNA compared with nonelderly patients undergoing EUS with FNA ($P = 1.0$). Figure 1 summarizes the specific complications for the elderly and nonelderly cohorts.

Medication Use

The medication doses required for safe procedural sedation with droperidol, fentanyl, promethazine/phenergan, and midazolam were significantly higher for the nonelderly cohort compared with the elderly cohort ($P < 0.001$). Table 1 summarizes the procedural sedation medication use within the cohorts.

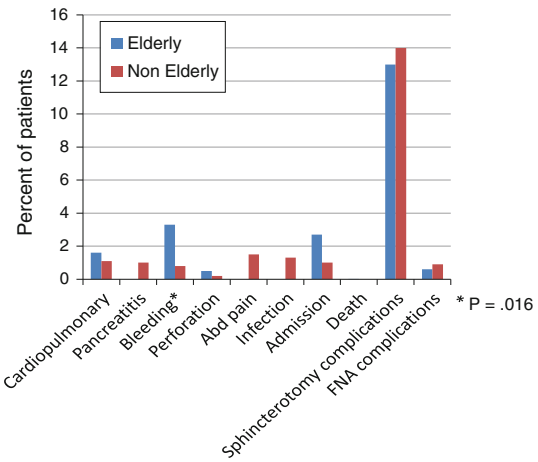

Fig. 1 Specific EUS/ERCP procedure complication rates for elderly (≥75 years old) and non elderly (<75 years old) patients

Discussion

As the median age of the population continues to increase, the number of endoscopic retrograde cholangiopancreatographies and endoscopic ultrasounds performed in elderly patients is also likely to increase. Advanced endoscopic procedures, specifically ERCP, is technically demanding and associated with higher rates of complications compared with other endoscopic procedures such as colonoscopy and esophagogastroduodenoscopy [9–11]. This study represents one of the largest evaluating the safety of advanced endoscopic procedures in elderly patients. While previous studies have found ERCP to be safe in the elderly, these studies have generally been performed with smaller cohorts [1–8]. Furthermore, to date, there is truly limited data focused on the safety of EUS in the geriatric population.

In previous studies, the rate of ERCP complications varies significantly due to the disparate definition of "complication" used by the investigators [1–14].

Although ERCP complication rates of up to 15.9% have been reported, our overall ERCP complication rates were significantly higher, on average, than expected compared with previous studies looking at advanced endoscopic procedures [1–10, 12]. This is largely due to the type of event included as a complication in our study. Using the ERCP complication classification system previously published by Cotton et al. [14] only 3% of our ERCP complications were moderate to severe for the elderly cohort and 1.4% for the nonelderly cohort ($P = 0.38$). The remainder of the ERCP complications were mild according to the Cotton classification. In addition to severe complications such as perforation, significant bleeding, pancreatitis, and death, we also included all postprocedure admissions, any intraprocedure mild bleeding, any intraprocedure respiratory or hemodynamic compromise, any postprocedure abdominal pain, and any intra- or postprocedure signs of infection. We purposefully included mild to moderate procedural-related events to evaluate the frequency of these events in the geriatric compared with the general population. Even with a broad definition of procedure-related complications, we did not find a significant overall increase in complications among elderly patients. Furthermore, there was no significant increase in the complication rate among elderly patients undergoing ERCP with sphincterotomy compared with among nonelderly patients undergoing ERCP with sphincterotomy. Thus, we found ERCP to be safe in elderly patients, and age should not be a contraindication to this increasingly common endoscopic procedure.

Overall, there was a significantly higher rate of ERCP complications for female patients (14%) compared with male patients (7%; $P = 0.006$). This is consistent with

known risk factors for ERCP complications [15, 16]. Contrary to prior studies, we did not find a significant increase in ERCP complications among patients with sphincter of Oddi dysfunction [15, 16]. This is likely due to the small number of cases evaluated with suspected sphincter of Oddi dysfunction for the procedure indication ($n = 12$).

Similar to the ERCP cohort, our overall EUS complication rate was higher than reported in previous studies [17–20]. This is again likely due to our broad definition of what is considered a procedure-related complication. To date, there is truly limited data on the safety and complication rates of EUS in the geriatric population. Our study represents one of the first and largest evaluating the safety of EUS ± FNA in older patients. Our overall EUS complication rate for the elderly patients was 4.8%, which was not significantly higher than the rate for the nonelderly cohort (3.1%; $P = 0.49$). There was no statistically significant increase in the complication rate for elderly patients undergoing EUS with FNA compared with nonelderly patients undergoing EUS with FNA ($P = 1.0$). Thus, EUS ± FNA is a safe procedure in geriatric patients, and age should not serve as a contraindication to the procedure.

Although there was no significant overall complication rate among elderly patients, there was a significantly higher rate of intra- and postprocedure bleeding within the elderly cohort (3.3%) compared with in the nonelderly cohort (0.8%; $P = 0.016$). Most of the procedure-related bleeding episodes were minor and controlled endoscopically, and did not require blood transfusion or hospital admission. Elderly patients are possibly at increased risk of bleeding due to certain comorbidities, as well as the frequent use of anticoagulant medication [21–24]. Despite trying to limit this risk by discontinuing anticoagulant and antiplatelet medication preprocedure, we found the bleeding risk to be higher in older patients. Endoscopists should be cognizant of this risk when performing advanced endoscopic procedures in older patients and should consider overnight observation post procedure should any bleeding be suspected. Contrary to the bleeding risk, there was no significant increase in other specific complications, such as cardiopulmonary compromise, pancreatitis, perforation, abdominal pain, infection, postprocedure admission, or death for the older cohort. Lastly, there was no increased risk of performing sphincterotomy or FNA for elderly patients compared with nonelderly patients.

Various sedating agents have been shown to be safe and effective for endoscopic procedures [24]. In our study, the doses of all medications required for safe sedation in elderly patients were significantly lower than in nonelderly patients undergoing the advanced endoscopic procedures. As a process of normal aging and decline in organ function, there are significant alterations in the pharmacologic response of elderly patients and, as a result, these patients can be more sensitive to sedating agents [25]. There were no episodes of torsades or other significant cardiac dysrhythmia nor any episodes of extravasation injury associated with intravenous phenergan. Procedure anesthesia should be individualized, but endoscopists should be aware of the decreased sedation needed for safe geriatric patient sedation. Starting at lower doses and titrating slowly has been advised for geriatric patients [25]. Furthermore, given the unique sedation requirements of elderly patients, endoscopists should consider performing these procedures in conjunction with anesthesiologists in order to safely sedate and adequately monitor these patients.

The World Health Organization's definition of geriatric patients for developed countries includes those ≥65 years old; however, this number is considered somewhat arbitrary. The average US life expectancy is 78 years and there is an increasing proportion of the US population aged ≥80 years. Although endoscopic societies have described advanced age as >80 years, this is a chronological age and again is somewhat arbitrary as it is based on opinion [26]. Currently, more endoscopic procedures are being performed on patients who are elderly. Although physiologic age is quite varied, we proposed to examine a cutoff of 75 years of age to try to better evaluate the risks of advanced endoscopic procedures within the truly older patient.

Limitations of this study include its retrospective design and increased risk of biases and confounders inherent to this design. There is also a potential loss to follow-up, as some of the patients were referred from outlying areas, which could lead to failure to identify complications if patients sought care outside of the University of Wisconsin system. However, the numbers of patients lost to follow-up would presumably be proportional within the two cohorts, and this would therefore be unlikely to alter the results of the study significantly. One other possible limitation of this study is the broad definition of complication used in the data collection. Some of the events included as complications in the analysis (i.e., prophylactic overnight postprocedure hospitalization in elderly patients) would not be included in analyses with a stricter definition of complication [27]. While this allows for greater sensitivity to subtle differences between complication rates in the two cohorts as discussed above, it may limit comparisons with other published studies using a narrower definition.

Another potential criticism of our manuscript would be the low percentage of ERCP procedures with sphincterotomy and EUS procedures with FNA. The University of Wisconsin is a tertiary care center and the only facility offering EUS within the Madison area. The teaching hospital has an active liver transplant program. Many of the

ERCPs are performed on liver transplant patients, many of whom have had previous sphincterotomies. Furthermore, a large proportion of the endoscopic ultrasounds are performed for esophageal cancer staging and for pancreatic pathology other than mass lesions. In such cases, fine-needle aspiration may not be warranted. Moreover, within the state, there are other centers that perform EUS, and the University of Wisconsin gets selective referrals to repeat and reevaluate for pathology. Lastly, our center potentially may not have had as many EUS procedures with FNA during the early stages of program establishment in 2002, and this may be reflected in the data collection during the dates mentioned (2003–2005). We report the percentage values during the time period assessed; however, on an annual basis our EUS volume has grown to include over 500 procedures per year with FNA performed in approximately 40% for 2009.

As the median age of the population continues to increase, the number of endoscopic retrograde cholangiopancreatographies and endoscopic ultrasounds performed in elderly patients will continue to grow. Despite the known relative increased procedural risks, advanced age is not a contraindication to advanced endoscopic procedures. Our study is one of the largest demonstrating no significant increase in the rate of overall procedure-related complications seen with either ERCP or EUS in elderly patients. Endoscopists should be aware of the increased bleeding risk in geriatric patients, as well as the decreased procedure-related sedation medication required for elderly patients.

References

1. Katsinelos P, Paroutoglou G, Kountouras J, Zavos C, Beltsis A, Tzovaras G. Efficacy and safety of therapeutic ERCP in patients 90 years of age and older. *Gastrointest Endosc*. 2006;63(3): 417–423.
2. Mitchell RM, O'Connor F, Dickey W. Endoscopic retrograde cholangiopancreatography is safe and effective in patients 90 years of age and older. *J Clin Gastroenterol*. 2003;36(1):72–74.
3. Rodriguez-Gonzalez FJ, Naranjo-Rodriguez A, Mata-Tapia I, et al. ERCP in patients 90 years of age and older. *Gastrointest Endosc*. 2003;58(2):220–225.
4. Chong VH, Yim HB, Lim CC. ERCP in the elderly: More than just the age factor. *Age Ageing*. 2006;35(3):322–323; author reply 323.
5. Deans GT, Sedman P, Martin DF, et al. Are complications of endoscopic sphincterotomy age related? *Gut*. 1997;41(4):545–548.
6. Gandolfi L, Rossi A, Vaira D, Tonti R, Ramini R. Endoscopic retrograde cholangiopancreatography (ERCP) in the elderly. *Acta Gastroenterol Belg*. 1986;49(6):602–607.
7. MacMahon M, Walsh TN, Brennan P, Osborne H, Courtney MG. Endoscopic retrograde cholangiopancreatography in the elderly: A single unit audit. *Gerontology*. 1993;39(1):28–32.
8. Rastogi A, Campbell DR. ERCP in the elderly: How safe is it? (marathons, marathon ERCPs, and marathon ERCPs in the elderly). *Gastrointest Endosc*. 2006;63(7):956–958.
9. Loperfido S, Angelini G, Benedetti G, et al. Major early complications from diagnostic and therapeutic ERCP: A prospective multicenter study. *Gastrointest Endosc*. 1998;48(1):1–10.
10. Christensen M, Matzen P, Schulze S, Rosenberg J. Complications of ERCP: A prospective study. *Gastrointest Endosc*. 2004;60(5): 721–731.
11. Vandervoort J, Soetikno RM, Tham TC, et al. Risk factors for complications after performance of ERCP. *Gastrointest Endosc*. 2002;56(5):652–656.
12. Salminen P, Laine S, Gullichsen R. Severe and fatal complications after ERCP: Analysis of 2555 procedures in a single experienced center. *Surg Endosc*. 2008;22(9):1965–1970.
13. Freeman ML, Nelson DB, Sherman S, et al. Complications of endoscopic biliary sphincterotomy. *N Engl J Med*. 1996;335(13): 909–918.
14. Cotton PB, Lehman G, Vennes J, et al. Endoscopic sphincterotomy complications and their management: An attempt at consensus. *Gastrointest Endosc*. 1991;37(3):383–393.
15. Freeman ML. Understanding risk factors and avoiding complications with endoscopic retrograde cholangiopancreatography. *Curr Gastroenterol Rep*. 2003;5(2):145–153.
16. Freeman ML. Adverse outcomes of endoscopic retrograde cholangiopancreatography. *Rev Gastroenterol Disord*. 2002;2(4): 147–168.
17. Al-Haddad M, Wallace MB, Woodward TA, et al. The safety of fine-needle aspiration guided by endoscopic ultrasound: A prospective study. *Endoscopy*. 2008;40(3):204–208.
18. Eloubeidi MA, Tamhane A, Varadarajulu S, Wilcox CM. Frequency of major complications after EUS-guided FNA of solid pancreatic masses: A prospective evaluation. *Gastrointest Endosc*. 2006;63(4):622–629.
19. Bournet B, Migueres I, Delacroix M, et al. Early morbidity of endoscopic ultrasound: 13 years' experience at a referral center. *Endoscopy*. 2006;38(4):349–354.
20. Carrara S, Aricidiacono P, Mezzi G, Petrone MC, Boemo C, Testoni PA. Complication rate after EUS-Guided fine needle aspiration of pancreatic lesions: A large single center experience. *J Pancreas*. 2008;9:789.
21. Palareti G, Leali N, Coccheri S, et al. Bleeding complications of oral anticoagulant treatment: An inception-cohort, prospective collaborative study (ISCOAT). Italian study on complications of oral anticoagulant therapy. *Lancet*. 1996;348(9025):423–428.
22. Palareti G, Hirsh J, Legnani C, et al. Oral anticoagulation treatment in the elderly: A nested, prospective, case-control study. *Arch Intern Med*. 2000;160(4):470–478.
23. Laupacis A, Boysen G, Connolly S, et al. Risk factors for stroke and efficacy of antithrombotic therapy in atrial fibrillation. Analysis of pooled data from five randomized controlled trials. *Arch Intern Med*. 1994;154(13):1449–1457.
24. McQuaid KR, Laine L. A systematic review and meta-analysis of randomized, controlled trials of moderate sedation for routine endoscopic procedures. *Gastrointest Endosc*. 2008;67(6): 910–923.
25. Rivera R, Antognini JF. Perioperative drug therapy in elderly patients. *Anesthesiology*. 2009;110(5):1176–1181.
26. Qureshi WA, Zuckerman MJ, Adler DG, et al. ASGE guideline: Modifications in endoscopic practice for the elderly. *Gastrointest Endosc*. 2006;63(4):566–569.
27. Yimcharoen P, Fogel EL, Kovacs RJ, et al. Droperidol, when used for sedation during ERCP, may prolong the QT interval. *Gastrointest Endosc*. 2006;63(7):979–985.