

# Endoscopy

## Reprint

Endoscopy 2014  
Volume 46  
Page 857–861



**ESGE**

Official Organ of  
the European Society of  
Gastrointestinal Endoscopy  
(ESGE) and  
Affiliated Societies

[www.thieme-connect.com/  
products/endoscopy](http://www.thieme-connect.com/products/endoscopy)  
[www.thieme.de/endoscopy](http://www.thieme.de/endoscopy)

© 2014 by  
Georg Thieme Verlag KG  
Rüdigerstraße 14  
D-70469 Stuttgart  
ISSN 0013-726X

Reprint with the permission  
of the publishers only

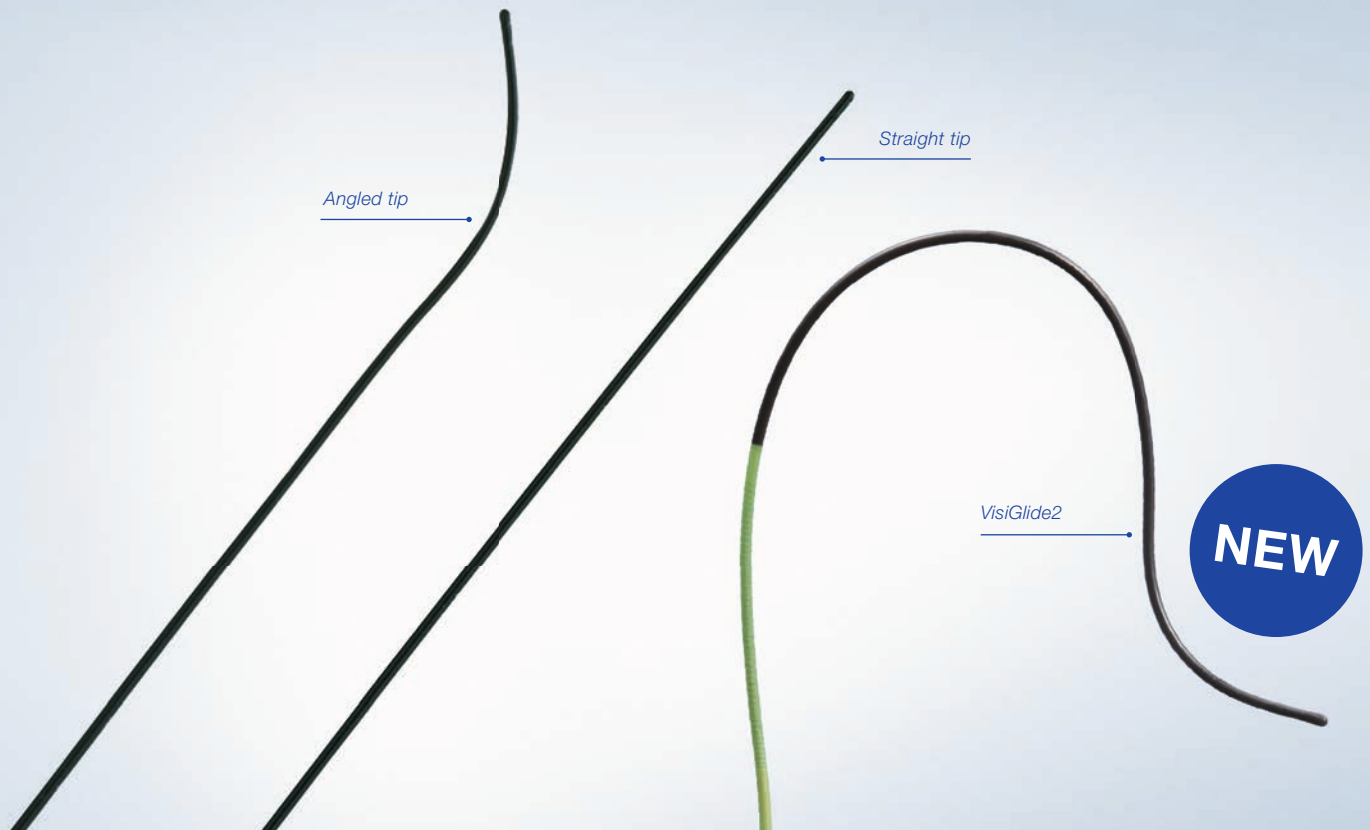


**A novel, stiff-shaft, flexible-tip  
guidewire for cannulation of biliary  
stricture during endoscopic  
retrograde cholangiopancreatography:  
a randomized trial**

Jörg G. Albert, Katja Lucas, Natalie Filmann,  
Eva Herrmann, Oliver Schröder, Christoph Sarrazin,  
Jörg Trojan, Bernd Kronenberger, Jörg Bojunga,  
Stefan Zeuzem, Mireen Friedrich-Rust



**Thieme**



## VISIGLIDE AND VISIGLIDE 2

### For Routine and Challenging ERCP – Master Cannulation with the Right Guidewire.

#### VisiGlide Concept

- Developed in cooperation with Terumo, VisiGlide stands out with the innovative concept of a 0.025-inch guidewire.
- Excellent torque control enhances maneuverability through biliary ducts.
- Soft and highly flexible tip for superior cannulation performance.
- Perfect guidewire shaft stiffness for easy therapeutic instrument exchange.

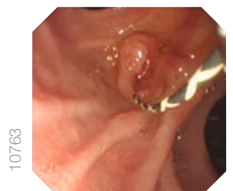
#### VisiGlide 2

- Maintaining the outstanding performance of VisiGlide.
- Slightly more tapered design enables easy alpha-loop formation.
- Shorter angled tip facilitates insertion into tortuous anatomy.



6993

Outstanding radiopacity



10763

Clear endoscopic visibility

# A novel, stiff-shaft, flexible-tip guidewire for cannulation of biliary stricture during endoscopic retrograde cholangiopancreatography: a randomized trial

## Authors

Jörg G. Albert<sup>1</sup>, Katja Lucas<sup>1</sup>, Natalie Filmann<sup>2</sup>, Eva Herrmann<sup>2</sup>, Oliver Schröder<sup>1</sup>, Christoph Sarrazin<sup>1</sup>, Jörg Trojan<sup>1</sup>, Bernd Kronenberger<sup>1</sup>, Jörg Bojunga<sup>1</sup>, Stefan Zeuzem<sup>1</sup>, Mireen Friedrich-Rust<sup>1</sup>

## Institutions

<sup>1</sup> Department of Medicine 1, J. W. Goethe University Hospital, Frankfurt, Germany

<sup>2</sup> Institute of Biostatistics and Math Modeling, Faculty of Medicine, J. W. Goethe University, Frankfurt, Germany

## submitted

18. February 2014

## accepted after revision

12. June 2014

## Bibliography

DOI <http://dx.doi.org/10.1055/s-0034-1377628>

Published online: 10.9.2014

Endoscopy 2014; 46: 857–861

© Georg Thieme Verlag KG

Stuttgart · New York

ISSN 0013-726X

## Corresponding author

Jörg Albert, MD

Department of Internal

Medicine I

Johann Wolfgang Goethe-

University hospital

Theodor-Stern-Kai 7

60590 Frankfurt

Germany

Fax: +49-69-63016247

J.Albert@med.uni-frankfurt.de

**Background and study aims:** During endoscopic retrograde cholangiopancreatography (ERCP), a guidewire is used to cannulate biliary strictures and allow for therapeutic interventions. The aim of this study was to assess the success of stricture cannulation using a combination of a flexible guidewire and a stable nitinol wire vs. a novel, single, stiff-shaft, flexible-tip guidewire.

**Patients and methods:** Consecutive patients who were scheduled for ERCP for biliary obstruction were randomized to undergo the procedure with either a 260-cm long, angled-tip hydrophilic wire in combination with a nitinol wire as required (standard group), or a novel, 270-cm guidewire featuring a hyperflexible, hydrophilic tip with a stiff shaft (novel group). At unsuccessful negotiation of the stricture, patients in the standard group were switched to the novel guidewire and vice versa (“crossover”). Successful cannulation (primary success: as assigned; final success: after “crossover”), procedure time, and total number of wires needed per procedure were compared.

**Results:** A total of 222 patients were randomized and 197 were included in the study (97 in the standard group and 100 in the novel group). The primary success rate was significantly higher in the novel group (94/100, 94%) compared with the standard group (77/97, 79%;  $P=0.00041$ ), and final success was similar. Mean time (median, interquartile range) to stricture cannulation was 11.2 minutes (6.3, 3.7–14.6) in the standard group and 8.1 minutes (2.5, 0.9–7.7) in the novel group ( $P<0.0001$ ). The mean total procedure time was 31.2 minutes (24.6, 16.5–40.8) vs. 24.3 minutes (16.9, 10.0–31.5), respectively ( $P=0.0011$ ). There were no complications observed with either of the guidewires.

**Conclusions:** A guidewire that features a flexible tip with a stable shaft could replace the use of a combination of flexible and stable guidewires and increase the success rate of stricture cannulation while decreasing the procedure time.

ClinicalTrials.gov Identifier: NCT 01382680

## Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is the standard technique for interventional treatment of biliary disease. During the procedure a guidewire is used to intubate and traverse biliary strictures and to maintain access for the introduction of therapeutic devices into the biliary tract. Moreover, guidewires are increasingly accepted for primary cannulation of the ampulla of Vater. The wire-guided technique has been found to increase the primary cannulation rate and to reduce the risk of post-ERCP pancreatitis compared with the contrast-injection method [1,2].

Two major advancements in the construction of guidewires were made recently. First, the introduction of the short wire concept, and second, the combining of several features of traditional guidewires into one product (e.g. tip shape, flex-

ibility together with stiffness, hydrophilic coating of only part of the guidewire) in order to achieve optimal flexibility while maintaining the necessary rigidity and steerability. Other characteristics such as radiopaque markers to improve visibility of the guidewire under fluoroscopy, and marking of the guidewire surface for delineation of the position in the endoscopic field of view have also been incorporated into the latest guidewires.

However, it remains unclear whether the recent improvements in guidewire design and construction have actually had an impact on the success rate of the procedure or on the procedure time. The aim of the present study, therefore, was to assess the outcomes of therapeutic ERCP using a combination of well-established guidewires compared with a recently developed, single, hydrophilic guidewire.

## Patients and methods



### Study design

This was an open-label, randomized, single-center, single-blinded trial assessing the value of a new hydrophilic guidewire in comparison with a combination of traditionally used wires. The patients were blinded to the allocation arm. Randomization and recording of the data were done independently from clinical investigators; a statistician received the request for randomization before ERCP and after informed consent of the patient had been obtained, and returned the allocation via fax before the investigation started.

All patients who presented for ERCP with a suspected or previously diagnosed biliary stricture were eligible for randomization. Biliary obstruction was suspected clinically based on symptoms (e.g. jaundice, fever, right upper quadrant abdominal pain), laboratory data (elevated liver enzymes, alkaline phosphatase, gamma-glutamyltransferase, bilirubin), and imaging results (abdominal ultrasonography, magnetic resonance imaging, computed tomography) that indicated enlarged extrahepatic and/or intrahepatic bile ducts. Suspicion of obstruction at pre-ERCP tests indicated a need for wire-guided intubation of the native papilla and consecutive wire-guided biliary sphincterotomy, and/or negotiation of the stricture after contrast had been injected for visualization. In cases where no stricture was detected during ERCP and no guidewire was therefore needed, the patient was excluded from the analysis.

Inclusion criteria were: age  $\geq 18$  years, suspected biliary obstruction (e.g. neoplastic, postoperative, inflammatory stricture or obstructing stones) with a requirement for guidewire use during ERCP for therapeutic intervention. Exclusion criteria were: indication for pancreatic ERCP and surgically altered anatomy (e.g. Billroth II, Roux-en-Y anastomosis).

The study protocol was approved by the institutional review board (No. 136/10 of the local ethics committee of the University Hospital Frankfurt), and written informed consent was obtained from all patients prior to study inclusion.

The study was registered at ClinicalTrials.gov ([www.clinicaltrials.gov](http://www.clinicaltrials.gov)) with the identifier NCT01382680.

### Procedures

In the standard guidewire group, the investigation was first performed using a traditional guidewire: 0.032-inch, 260-cm long, angled-tip, hydrophilic wire covered with polyurethane and hydrophilic coating (Terumo Radiofocus; Terumo Europe, Leuven, Belgium). In this group, exchange to a nitinol wire for therapeutic interventions (e.g. MTW J-tip, 0.035-inch, 400-cm; MTW Endoskopie Inc., Wesel, Germany) was permitted. In the novel guidewire group, the investigation was performed with a 270-cm long, fluorine-coated guidewire that combined a 7-cm highly flexible tip with a stiff shaft (0.035" or 0.025", hydrophilic coating, length 70mm, angled tip; Olympus VisiGlide, Olympus Europe, Hamburg, Germany).

In cases where the stricture could not be passed by the guidewire during a 10–20-minute period, patients in the standard group crossed over to the novel guidewire and vice versa. Furthermore, when 10 minutes had passed without treatment success, a change in investigator was encouraged and another 10 minutes were spent before the patient was switched to the alternative method. The endoscopy teams for both groups were free to select an angled-tip or a straight-tip guidewire; however, all endoscopists selected the angled-tip guidewire for all first procedures.

A straight-tip guidewire could have been chosen if necessary. Crossover was performed in all cases when no treatment success was obtained despite investigator change. After crossover, the VisiGlide guidewire was used in the standard group and the Terumo guidewire was used in the novel group.

Standard Olympus duodenoscopes (Olympus V-Scopes, TJF 160VF, TJF-Q180 V; Olympus Europe) were used for ERCP, and the short-wire technique with locking of the wire at the distal end of the duodenoscope was applied. Choice of catheter was left to the investigator, but the standard cannula was the single-use sphincterotome (CleverCut3V; Olympus Europe) and/or a straight standard catheter (e.g. MTW standard or single-use cannula StarTip2V) that may or may not have been bent slightly by the investigator. Contrast agent was injected after secure access to the biliary system had been achieved, as confirmed by the passage of the guidewire on radiographic examination. All other aspects of the ERCP procedure were left to the discretion of the attending endoscopist.

All investigators who took part in the study (J.G.A., C.S., J.B., J.T., O.S., M.F.R.) were highly experienced in ERCP and had performed at least 1000 ERCP procedures prior to the study.

The investigation times were recorded by the gastrointestinal fellow or by an in-room gastrointestinal assistant as follows. The stopwatch was started when the endoscopist had positioned the endoscope in the duodenum and was ready to cannulate the papilla with the guidewire preloaded inside the papillotome/cannula. The first timing was registered when the guidewire had crossed the obstruction. In cases where the flexible hydrophilic wire needed to be changed to a stable nitinol wire for therapeutic measures in the standard group, the time was recorded when the final position of the stiff guidewire was achieved. If the wire position changed, but access was not lost, the time continued to be recorded until the correct position was regained. The second timing was registered as soon as the procedure was completed and all devices and the endoscope had been removed from the bile duct.

### Statistics, data collection, and outcomes

#### Study end points

The primary end point was the number of guidewires used per ERCP procedure. Secondary end points were achievement of treatment success (primary success: as assigned; final success: after "crossover"), time to pass the stricture, and time to treatment success. Based on previous experience using the guidewires, it was assumed that 70%–75% of procedures would use one guidewire, 20% would require a second guidewire attempt, and 5% would fail.

#### Randomization

A stratified block randomization was performed using MATLAB (Release 2010; The MathWorks, Inc., Natick, Massachusetts, USA), stratified for location of the lesion (proximal, distal) and the nature of the stricture as assumed from cross-sectional imaging and other clinical data prior to ERCP (i.e. benign extrahepatic stenosis, benign intrahepatic stenosis, malignant extrahepatic stenosis, and malignant intrahepatic stenosis). The random allocation sequence was generated by an independent statistician. Patients were enrolled by the endoscopist or study assistant, and informed consent was obtained from the patient by doctors assigned to the study.

	Standard	Novel	P value
n	97	100	
Female, n (%)	46 (47.4)	37 (37.0)	n.s.
Age, years $\pm$ SD, years	61.6 $\pm$ 15.04	59.7 $\pm$ 14.79	n.s.
Native papilla, n (%)	28 (28.9)	31 (31.0)	n.s.
Indication, n (%)			
Benign extrahepatic stenosis	24 (24.7)	29 (29.0)	
Benign intrahepatic stenosis	16 (16.5)	16 (16.0)	
Malignant extrahepatic stenosis	19 (19.6)	20 (20.0)	n.s.
Malignant intrahepatic stenosis	29 (29.9)	24 (24.0)	
Bile duct stones	9 (9.3)	11 (11.0)	
Laboratory data, median (IQR)			
Creatinine, mg/dL	0.97 (0.81–1.28)	0.93 (0.76–1.29)	n.s.
Normal range 0.5–0.9			
C-reactive protein, mg/dL	1.99 (0.64–8.07)	2.35 (0.58–9.09)	n.s.
Normal <5			
Bilirubin, mg/dL	2.0 (0.8–6.6)	2.2 (1.1–7.0)	n.s.
Normal <0.9			
ALP, U/L	245 (138–511)	299 (156–637)	n.s.
Normal <40			
GGT, U/L	411 (154–858)	405 (115–975)	n.s.
Normal range 55–105			

ALP, alkaline phosphatase; GGT, gamma-glutamyltransferase/gamma-glutamyl transpeptidase; n.s., not statistically significant.

### Sample size calculation

On the basis of a significance level of  $\alpha=5\%$ , a two-sided chi-squared test was done, which indicated a statistical power of  $>99\%$  for the primary end point for randomization of 266 patients (1:1 randomization, effect size of 0.68, Cohen's W [3]). The primary study aim (i.e. comparison of number of guidewires needed) and the secondary study aim (i.e. an equivalence test between success rates of the two groups with an equivalence margin of 7.5% with a power  $>80\%$ ) were both analyzed. With this premise and the assumption that the secondary end point (treatment success) would be achieved in 95% in both groups, it was calculated that 266 patients would be required. However, patient recruitment was slower than anticipated, as repeated investigations in the same patient could not be included and patients who presented in an emergency situation in many cases could also not be included. Therefore, it was decided to terminate study recruitment when 222 patients had been included. It was assumed that the study aims could still be tested with a high statistical power.

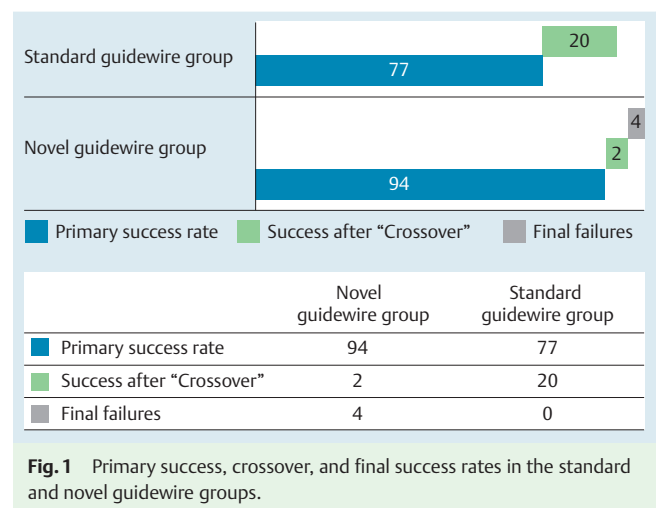
### Data analysis

Success rate, procedure time, and total number of guidewires needed per procedure were compared between the standard and novel groups. Categorical variables were compared using the chi-squared test or Fisher's exact test, and quantitative variables were compared using the Mann-Whitney U test. Tests were two sided. P values below 5% were considered to be significant. Statistical analysis was carried out using BiAS (version 10.04, BiAS for Windows; Epsilon-Verlag, Frankfurt, Germany) and WinSTAT for Microsoft Excel (Version 2012.1; Robert K. Fitch Verlag, Germany).

### Results

A total of 222 patients were randomized during the study period (Oct 2010 to Oct 2013). Patients were excluded from the analysis after randomization for the following reasons: no stricture de-

**Table 1** Characteristics of patients in the standard and novel guidewire groups.



**Fig. 1** Primary success, crossover, and final success rates in the standard and novel guidewire groups.

tected at ERCP (n=11, 5.0%), protocol violation (n=8, 3.6%), the papilla was not reached by the endoscope or intubation of the papilla failed (n=4, 1.8%), or consent was withdrawn (n=2, 0.9%). Thus, 197 patients were included in the final analysis (83 female, 114 male). Baseline characteristics of the patients are shown in **Table 1**.

A higher number of guidewires was needed for stricture cannulation in the standard group (mean 2.0 guidewires: 6.2% with one, 80.4% with two, and 13.4% with three or more) compared with the novel guidewire group (mean 1.1: 92% with one, 6% with two, and 2% with three or more;  $P<0.001$ ). The median number of guidewires needed per procedure was 2 (range 1–4) in the standard group and 1 (range 1–3) in the novel group. The treatment aim (final success rate) was achieved in all patients (100%) in the standard group and in 96/100 patients (96%) in the novel group ( $P=0.12$ ). However, the primary success rate was significantly higher in the novel guidewire group than in the standard group ( $P=0.00041$ ) (**Fig. 1**). The biliary stricture could not be passed in four patients. In two of these patients, concomitant

**Table 2** Time needed for implantation of 1, 2, or  $\geq 3$  stents in the standard and novel guidewire groups.

Stents, n	Standard vs. novel guidewire, n	Time to end of procedure, minutes				P
		Standard		Novel		
		Median	IQR	Median	IQR	
1	37 vs. 39	22.7	14.1–37.0	18.8	9.8–39.7	>0.20
2	35 vs. 33	25.4	17.4–40.9	15.5	9.6–21.5	<0.001
$\geq 3$	11 vs. 12	36.1	25.9–50.9	23.2	16.9–28.9	<0.001

IQR, interquartile range.

duodenal tumor stenosis complicated the positioning of the duodenoscope at the papilla, but cannulation of the common bile duct was successful without achieving traversal of the biliary stricture.

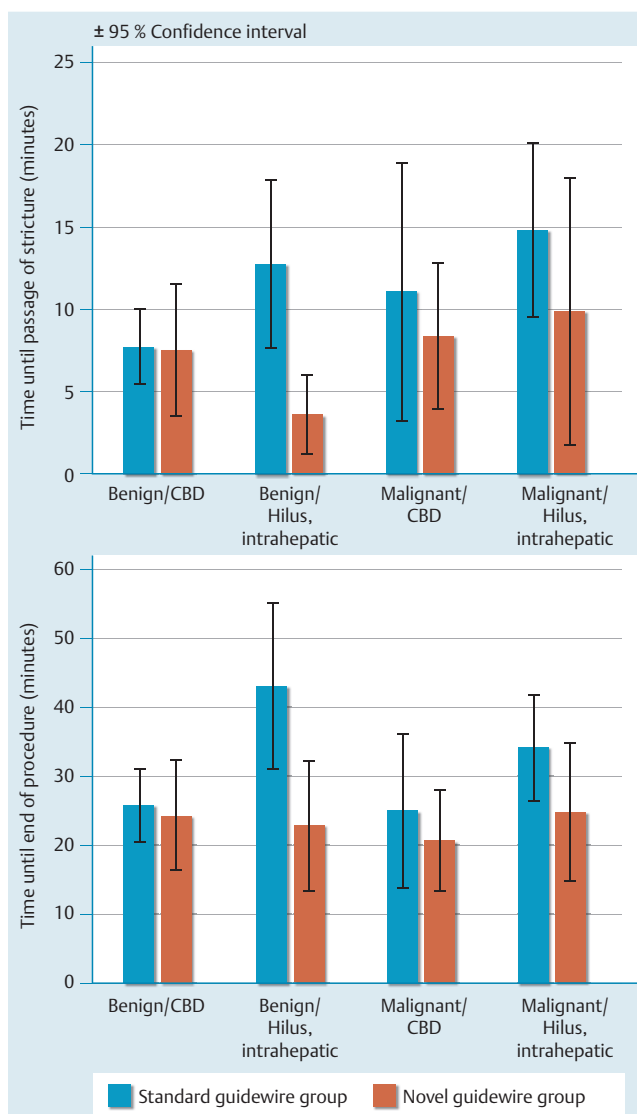
The mean time to pass the stricture was 11.2 minutes (median 6.3 minutes, interquartile range [IQR] 3.7–14.6) in the standard group and 8.1 minutes (median 2.5 minutes, IQR 0.9–7.7) in the novel group ( $P < 0.0001$ ). The mean total procedure time was 31.2 minutes (median 24.6 minutes, IQR 16.5–40.8) vs. 24.3 minutes (median 16.9 minutes, IQR 10.0–31.5), respectively ( $P = 0.0011$ ). There was a significant difference between the groups with respect to the time needed to insert the stent through the biliary stricture (Table 2).

The mean total procedure times in the standard and novel groups were 25.6 vs. 24.2 minutes in benign obstruction of the common bile duct, 43.0 vs. 22.8 minutes in benign hilar or intrahepatic stricture, 24.8 vs. 20.5 minutes in malignant extrahepatic stenosis, and 34.0 vs. 24.6 minutes in malignant hilar or intrahepatic stenosis. The procedure times are presented in Fig. 2.

No complications were observed in either of the groups.

## Discussion

Hydrophilic guidewires are currently well-accepted devices and part of the armamentarium in therapeutic ERCP [4]. These wires, which are torquable and ultra-slippy when moistened, facilitate difficult biliary stricture cannulation and stricture traversal [5]. After achieving access with a hydrophilic wire, most endoscopists will exchange the hydrophilic wire to a second more stable guidewire in order to avoid losing the guidewire position and to improve stability when introducing a stent or other device over the wire [6]. Recently, new guidewires that combine these features have been developed (i.e. hydrophilic cover plus high flexibility of the tip of the wire to negotiate the stricture, and a stable shaft of the wire to take therapeutic devices). Thereby, stability is increased and steerability of the guidewire is improved. In the current randomized trial, the novel guidewire, which combined a hydrophilic, flexible fluorine tip with a stiff nitinol shaft, achieved a higher rate of primary cannulation success of an obstructed bile duct segment and a shorter investigation time compared with the use of an initial extra flexible wire for stricture cannulation and a stiffer guidewire for therapeutic intervention. The higher success of the novel guidewire might be explained by improved steerability: the inflected tip is maneuvered by rotating the shaft and thereby enables the stricture to be negotiated under good visualization on fluoroscopy. This seemed to be particularly useful in patients with advanced primary sclerosing cholangitis or in those with intrahepatic malignant stricture, where contrast was injected only into those segments of the ob-



**Fig. 2** Time to pass the stricture and time to end of procedure according to type and location of the stricture. CBD, common bile duct.

structed biliary system that had been accessed by the guidewire to enable stent placement for prevention of cholangitis. The shorter time needed for the interventions with primary use of the novel guidewire might also be explained by the fact that wire exchange was not necessary and fewer stents were placed compared with the use of standard guidewires.

We preferred the angled-tip rather than the straight-tip wires for all procedures mainly because previous personal experience had

shown improved success in probing strictures when using the angled-tip wires.

There are some limitations of this study. The impact of the guidewire on successful cannulation of the papilla vs. the success rate for negotiating the biliary stricture was not differentiated, and only the combined outcome of cannulation success was calculated. However, treatment success may be regarded as the essential end point for the outcome of guidewire use, as this event is decisive for the patient. Moreover, findings from this study cannot be generalized to other guidewires that have not been tested, and additional trials are needed to compare the superior guidewire from this study to other guidewires on the market.

A reduction in the procedure time results in reduced fluoroscopy and sedation requirements and therefore is an important objective for improving ERCP technique [7]. Several recent innovations in the ERCP technique have contributed to a reduction in the procedure time: locking the guidewire with the Albaran lever by the V-system of the duodenoscope resulted in a 3-fold faster exchange of accessories in a recent study [8]. In the current study, the V-scopes were used in all patients and the findings are therefore based on using this technique; nevertheless the mean procedure time was reduced by almost 8 minutes in the novel guidewire group compared with the standard group (i.e. about 30% of the complete investigation time). The higher success rate of the new guidewire in this randomized trial strongly suggests that time savings are attributable to the success of the procedure and less so to the faster exchange of accessories. Moreover, with an increasing number of stents, more time was saved using the novel guidewire. Other study groups have reported a reduction in the procedure time by using short-wire systems compared with traditional long-wire devices [9], and the short-wire technique might have contributed to the reduced procedure time in the current study too.

With improvement in interventional ERCP, the rate of in-hospital mortality from acute biliary conditions requiring ERCP decreased in a recent cohort study using the nationwide inpatient sample of a U.S. database, but unsuccessful ERCP was associated with increased mortality [10]. Another study found that delayed and failed ERCP is associated with prolonged hospital stay and increased cost of hospitalization [11]. Success of ERCP depends on many factors, the most important of which is probably the experience of the endoscopy team and the indication of ERCP. In addition, there seems to be significant influence of technical devices such as guidewires on success in ERCP, for example an angled-tip guidewire facilitated biliary cannulation in a randomized trial [12]. In the current study, angled-tip guidewires were used as first choice in all patients, as the study endoscopists had experienced increased success with this device compared with straight-tip wires, which were only used when success of the investigation required a change in the tip type. Size of the guidewire (0.025" vs. 0.035") seems to be less important for success as recently reported in a prospective study [13]. In our experience, direct transmission of torque was a key feature for success of the

VisiGlide guidewire, together with an angled tip that helped to negotiate a stricture. Nevertheless, in two patients (2%), final success was only attained with a procedure using the hydrophilic Terumo guidewire, indicating that supply of several guidewires with different features might be necessary in order to be prepared for difficult ERCP cases within a specialized center.

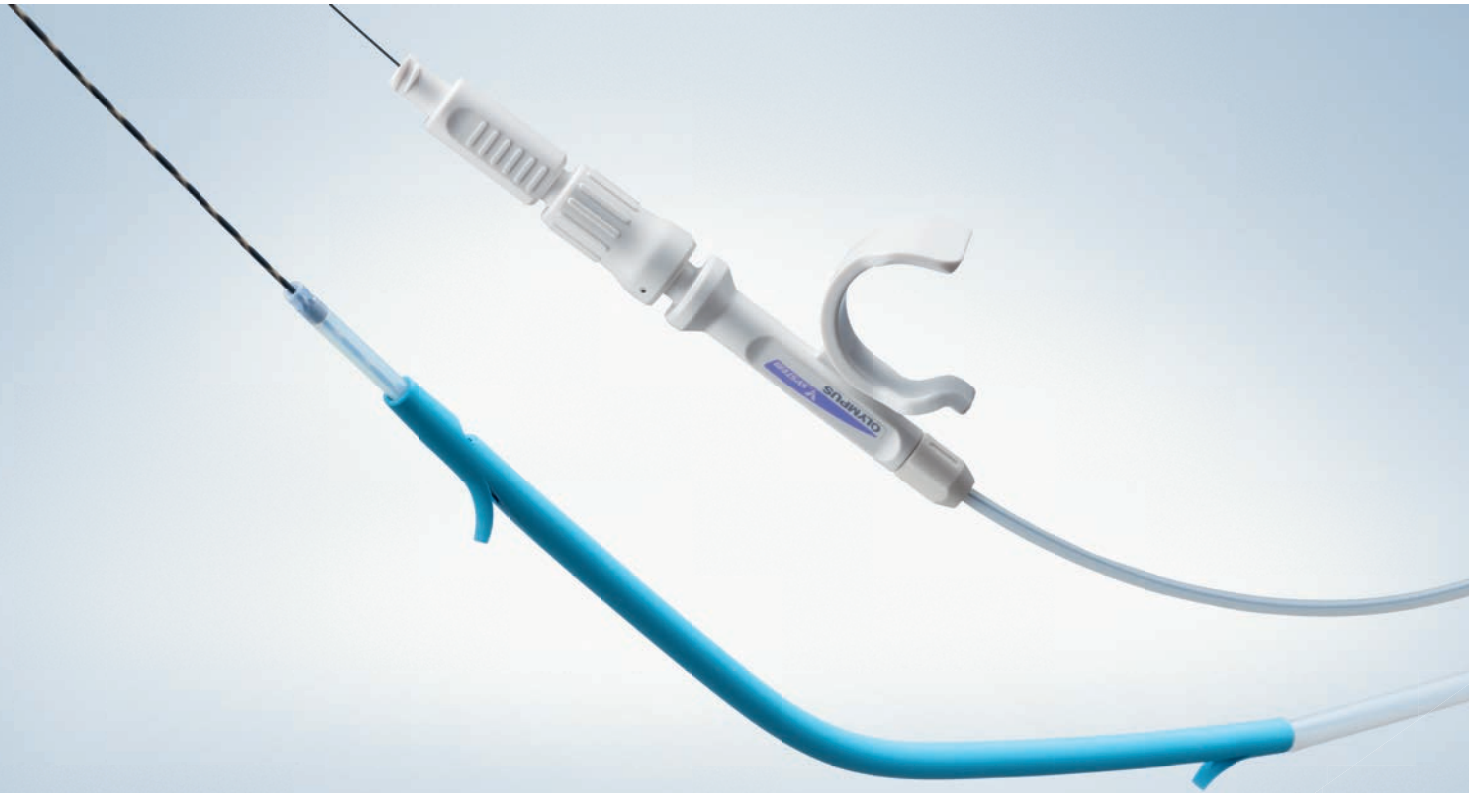
In summary, a guidewire that combines the features of a flexible, hydrophilic tip with a stiff nitinol shaft may replace the requirement to use both a flexible hydrophilic wire and a stable nitinol wire and thereby increase success rates of stricture cannulation and decrease procedure time.

**Fig. 1** was corrected

**Competing interests:** This study was partially supported by a grant from Olympus Europe, Hamburg, Germany.

## References

- 1 Cennamo V, Fuccio L, Zagari RM et al. Can a wire-guided cannulation technique increase bile duct cannulation rate and prevent post-ERCP pancreatitis? A meta-analysis of randomized controlled trials. *Am J Gastroenterol* 2009; 104: 2343–2350
- 2 Tse F, Yuan Y, Moayyedi P et al. Guide wire-assisted cannulation for the prevention of post-ERCP pancreatitis: a systematic review and meta-analysis. *Endoscopy* 2013; 45: 605–618
- 3 Cohen J. *Statistical power analysis for the behavioral sciences*. 2nd edn. Hillsdale, New Jersey: Erlbaum; 1988
- 4 Freeman ML, Guda NM. ERCP cannulation: a review of reported techniques. *Gastrointest Endosc* 2005; 61: 112–125
- 5 McCarthy JH, Miller GL, Laurence BH. Cannulation of the biliary tree, cystic duct and gallbladder using a hydrophilic polymer-coated steerable guide wire. *Gastrointest Endosc* 1990; 36: 386–389
- 6 Papachristou GI, Baron TH, Gleeson F et al. Endoscopic retrograde cholangiopancreatography catheter and accessory exchange using a short hydrophilic guide wire: a prospective study. *Endoscopy* 2006; 38: 1133–1136
- 7 Albert JG, Riemann JF. ERCP and MRCP – when and why. *Best Pract Res Clin Gastroenterol* 2002; 16: 399–419
- 8 Raithel M, Naegel A, Seidel S et al. Refinement of ERCP by using the Olympus V-scope system with a 0.025 in. compatible and complete fixable Visiglide® guidewire. *Dig Liver Dis* 2011; 43: 788–791
- 9 Draganov PV, Kowalczyk L, Fazel A et al. Prospective randomized blinded comparison of a short-wire endoscopic retrograde cholangiopancreatography system with traditional long-wire devices. *Dig Dis Sci* 2010; 55: 510–515
- 10 James PD, Kaplan GG, Myers RP et al. Decreasing mortality from acute biliary diseases that require endoscopic retrograde cholangiopancreatography: a nationwide cohort study. *Clin Gastroenterol Hepatol* 2014; 12: 1151–1159 e6
- 11 Khashab MA, Tariq A, Tariq U et al. Delayed and unsuccessful endoscopic retrograde cholangiopancreatography are associated with worse outcomes in patients with acute cholangitis. *Clin Gastroenterol Hepatol* 2012; 10: 1157–1161
- 12 Vihervaara H, Gronroos JM, Koivisto M et al. Angled- or straight-tipped hydrophilic guidewire in biliary cannulation: a prospective, randomized, controlled trial. *Surg Endosc* 2013; 27: 1281–1286
- 13 Halttunen J, Kylanpää L. A prospective randomized study of thin versus regular-sized guide wire in wire-guided cannulation. *Surg Endosc* 2013; 27: 1662–1667



## EFFICIENT BILIARY DRAINAGE

**A Wide Range of Plastic Stents to Meet Your Biliary Drainage Needs.**

### **Optimal Stent Flexibility**

Softer material and the maximised inner lumen design provide optimal flexibility to maintain drainage capability.

### **Excellent Insertability and Stent Deployment**

Improved material stiffness eases insertion for smooth delivery of the stent. Reduced friction between the guide catheter and pusher tube for effortless stent deployment.

### **Wide Line-Up**

QuickPlaceV comes in many different shapes, lengths and diameters, both as preloaded and single stent.

