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Case Report

Balloon catheter cannulation for route identification and axis stabilization during direct freehand cholangioscopy

Vincent Zimmer^{1,2,*}

ABSTRACT

Freehand techniques for direct cholangioscopy access have received little attention, given disappointing initial results and high perceived and/or real technical challenges. However, while pure freehand intubation appears feasible in a significant proportion of individuals, technical advancements and tricks of the trade are being developed. Along these lines, herein I present another rescue technique assisting in freehand access for direct cholangioscopy, the “balloon-catheter-cannulation technique”, which may be instrumental in overcoming two major hurdles of the procedure, i.e., stable intubation of the papillary orifice with adequate orientation and scope advancement in the common bile duct vis-à-vis gastric loop formation. To further disseminate direct cholangioscopy in the endoscopy community, technical beyond technological advancements, as for instance dedicated next-generation cholangioscopes, appear essential. Herein, I present a technical case report focussing on the limitations of the pure freehand and relative advantages of the “balloon catheter cannulation-assisted” approach for direct cholangioscopy access.

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Keywords: Cholangiopancreatography, endoscopic retrograde; Choledocholithiasis; Direct cholangioscopy

Introduction

Recent developments in direct cholangioscopy (DC) have renewed interest in this innovative biliary endoscopy modality with potential benefits, among others, in management of complex bile duct stone disease, clinical work-up of indeterminate biliary stricture, and inconclusive cholangiographic findings.¹ While implementation of specifically dedicated accessories, such as second-generation anchoring balloons, has been propagated, successful freehand intubation of the bile duct after wide-incision papillotomy and/or papillary balloon dilation has been reported in case series and individual reports using ultra-slim as well as standard-size scopes.^{2,3} Of interest, recently high rates of ancillary-free bile duct intubations were reported for a next-generation double-bending cholangioscope.⁴ *A priori* freehand DC access may reduce procedure-related accessory consumption and, thus, costs, and may help disseminate this disruptive endoscopic approach to a wider range of endoscopy services. However, in cases where pure freehand approaches fail, re-purposed use of endoscopic or radiologic equipment has been reported, e.g., by using a so-called Kautz probe or a colonoscopy-devoted stiffening wire.^{5,6}

Furthermore, in a recent case series snare-assisted DC has been introduced.⁷ Herein, I present a video paper demonstrating the limitations of the pure freehand approach and present the relative advantages of the “balloon catheter cannulation-assisted” DC access.

During the procedure, there are typically three categories of challenges encountered: (1) stable intubation of the papillary orifice itself with adequate visual orientation, (2) stable scope advancement in the distal bile duct portion during loop resolution, and (3) navigation up to or, at least, adequate endoscopic visualization of the liver hilum as a proxy of procedural completeness.

Case Report

This is a case, in which DC was indicated for definitive exclusion of remnant common bile duct (CBD) stones, given a markedly dilated biliary system up to 25 mm, in which the sensitivity of cholangiography is known to become utterly decreased (Fig. 1A). Beforehand, a revisional endoscopic papillary large-balloon dilation up to 12 mm (CRE Balloon Dilator; Boston Scientific, Ratingen, Germany) was performed due to papillary stenosis after

¹Department of Medicine, Marienhausklinik St. Josef Kohlhof, Neunkirchen, Germany²Department of Medicine II, Saarland University Medical Center, Saarland University, Homburg, Germany

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* Corresponding author. Department of Medicine, Marienhausklinik St. Josef Kohlhof, Klinikweg 1-5, 66539 Neunkirchen, Germany.

E-mail address: vincent.zimmer@gmx.de (V. Zimmer). ORCID: <https://orcid.org/0000-0002-6298-4717>

Fig. 1. Fluoroscopic correlation. (A) Dye cholangiogram demonstrating marked common bile duct (CBD) dilation up to 25 mm without filling defects or definitive stone detection, which, however, remains questionable in conderation of the well-recognized decrease in sensitivity vis-à-vis diffuse biliary dilation. (B) Direct cholangioscopy in pure freehand fashion succeeded in intubation of the papillary orifice; however, the ultra-slim upper endoscope (Fujinon EG-530NW; Fujifilm) repeatedly slipped out into the duodenum due to axial deviation, complicating instable scope positioning and “red out” situation blurring visual control. (C) Successful deeper intubation of the CBD after identification of the route and axis as well as scope stabilization with the “balloon-catheter-cannulation technique”.

Fig. 2. Endoscopic correlation. (A) View of the papillary orifice in attempts at pure freehand cholangioscopy after J maneuvering the scope in the duodenum. (B) “Red out” in the prepapillary common bile duct (CBD) portion obscuring identification of the route. (C) The tip of the balloon catheter improves visual control by gaining some distance from the biliary mucosa, thus facilitating intubation of deeper aspects of the CBD. (D) The balloon catheter is further advanced into the biliary system to improve axis stabilization. Inflation of the balloon is per se not required, although it may be helpful in situations, where the scope slips out to allow for rapid re-intubation (compare also the supplementary video sequence; Supplementary Video 1). (E) Visualization of the hilar region implying procedural completion. Note that neither air/CO₂ insufflation nor saline irrigation was needed due to marked biliary dilation.

re-do papillotomy up to the duodenal wall.⁸ As is illustrated in the supplementary video sequence (Supplementary Video 1), pure freehand intubation of the papilla using an ultraslim upper endoscope (outer diameter 5.9 mm, working channel 2.0 mm, Fujinon EG-530NW; Fujifilm, Düsseldorf, Germany) repeatedly failed due to blurred vision and axis deviation during forward movements of the endoscope after an adequate duodenal J maneuver (Fig. 1B, 2A, 2B). Therefore, after alignment into the papillary orifice in a freehand fashion, a 5 F balloon catheter (Endoflex, Voerde, Germany) was advanced to a minimum extent to resolve the “red out” situation, overcoming challenge (1) as described above (Fig.

2C). This step follows a similar rationale as a novel technique called the “tip-of-the-biopsy-forceps”, in which the tip of a biopsy forceps is minimally advanced to gain distance from the mucosa and thus reestablish proper visual orientation for papillary intubation.⁹ Next, the tip of the balloon was further advance to improve further stabilization of the force axis during push movements on the endoscope. Given an inadequate inflated balloon diameter relative to diffuse biliary tract dilation, true anchoring to allow push/pull movements (expectedly) failed, nonetheless adequate progress in scope advancement was achieved. This eliminated challenge (2) (Fig. 1C, 2C, 2D). At the time, with the cholangioscope in the

middle of the CBD, endoscopic visualization up to the hilum was achieved and unequivocally excluded remnant stone disease (Fig. 2E). Albeit navigation into the hilar region was not feasible (and in this case not mandatory) due to recurrent loop formation, switching from a simple balloon catheter to a biopsy forceps, for which anchoring and successful pulling up has been described (“the elevator technique”) might have represented valid option.¹⁰

Discussion

To conclude, DC remains a fascinating area in interventional pancreaticobiliary endoscopy, in which both innovative technological and technical progress is underway to move the field forward and disseminate the modality. Beyond pure freehand techniques, accessory-assisted troubleshooter approaches such as the “balloon-catheter-cannulation technique” may be instrumental to rescue DC access. While there are no direct systematic analyses comparing rescue biopsy forceps- versus balloon-assisted freehand DC and, in principle, consumption of accessories may increase, cost estimates may nonetheless indicate significant earnings relative to specialized cholangioscopy accessories such as dedicated access balloon and/or implementation of next-generation scope technologies.^{4,11} As for now, the presented “balloon-catheter-cannulation technique” might be attractive in individual cases to overcome DC access-related difficulties in route identification and axis stabilization. Limitations of the technique include, as has been presented, the reduced anchoring capability in a profusely dilated biliary system; however, true anchoring to facilitate pull movements is not invariably necessary for advancement in the bile duct.

Conflicts of Interest

No potential conflict of interest relevant to this article was re-

ported.

Supplementary Materials

Supplementary data is available at <https://doi.org/10.18528/ijgii180002>.

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