



Needle-knife assisted ERCP

R. Gullichsen, M. Lavonius, S. Laine, J. Grönroos

Department of Surgery, University of Turku, PB 52, Turku, FIN-20521, Finland

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Abstract

Background: During endoscopic retrograde cholangiopancreatography (ERCP), incising through the wall of the major papilla with an electrocautery needle-knife is a method for achieving access into the bile duct. This procedure, often referred to as a “precut,” may be used when cannulation attempts via the orifice of the papilla are unsuccessful. Potential complications include hemorrhage, duodenal perforation, and acute pancreatitis.

Methods: The 172 patients who underwent an attempt of a needle-knife assisted ERCP during the years 1997–2003 at our institution were retrospectively evaluated.

Results: A selective bile duct cannulation was achieved after needle-knife incision in 148 out of 172 patients (86%) at the primary session. In 10 additional patients (6%), a repeated procedure proved successful for cannulation. In the remaining 14 patients (8%), the biliary cannulation failed and was not attempted again. Complications after needle-knife assisted ERCP occurred as follows: three patients (2%) presented with late bleeding after the ERCP and three patients (2%) developed acute pancreatitis. None of the patients required operative treatment for complications. There was no mortality.

Conclusion: The use of the needle-knife markedly improves the success rate of selective biliary cannulation in ERCP without increasing the rate of complications.

Key words: Cannulation — Endoscopic procedure — Endoscopic retrograde cholangiopancreatography — Needle-knife — Papillotomy

Endoscopic retrograde cholangiopancreatography (ERCP) is frequently challenging even for an experienced endoscopist. Gaining an ideal position for cannulation may be difficult. The structure of the papilla may give rise to cannulation problems for various reasons. If standard cannulation fails, the use of a guidewire and/or

a bendable cannula usually allows the access into the bile duct. When even these methods result in failure, an electrocautery needle-knife can be used for creating an opening through the anterior wall of the papilla. This technique is referred to as a needle-knife sphincterotomy, a needle-knife papillotomy, or a needle-knife fistulotomy, depending on the extent of the incision on the papilla [4, 8, 11]. The needle-knife approach causes a potential risk for bleeding, perforation of the duodenal wall, and acute pancreatitis [7]. We conducted this retrospective analysis to assess the feasibility and safety of needle-knife assisted ERCP in achieving access into the bile duct in our hands.

Patients and methods

During the years 1997–2003, a total of 2,029 patients were admitted for ERCP to our institution, Turku University Central Hospital, which is a 1,200-bed teaching hospital serving an area of 435,000 inhabitants in southwestern Finland. Of the 2,029 patients, 236 had a repeat procedure, whereas 1,793 patients underwent a first-time ERCP. In 1,703 of the 1,793 patients with first-time ERCP, the access to the papilla of Vateri was unhindered, whereas 90 patients had altered anatomy preventing adequate visualization of the papilla (duodenal or pyloric tumour or obstruction, previous gastric surgery, etc.).

All the ERCPs were done by the authors. Patients were positioned on the left side during the ERCP. When standard cannulation attempts of the biliary duct failed, we tried to gain duct access using a guide wire. When even the guide-wire method proved unsuccessful, we performed the incision with an electrocautery needle-knife cannula through the anterior wall of the papilla. With either a guide wire or contrast injection, the bile duct was then identified and selectively cannulated and visualized. We did not rule out any patient from this modality. So, for example; nondilated ducts, small papillae, or anti-coagulant medication (when the coagulation index was appropriate) was not considered a contraindication. However, when the endoscopist estimated, on the basis of the appearance of the papilla, that standard cannulation would not be successful, the needle-knife approach was employed as a first choice in few cases. In addition, in 34 patients with failed cannulation attempts via the orifice of the papilla, the needle-knife assisted technique was not used. In these patients, the visualization of the bile ducts was considered of secondary importance and the indication for examination was reevaluated. None of them were readmitted for ERCP.

The diagnosis of acute pancreatitis was based on classical clinical findings (acute abdominal pain and tenderness, nausea and vomiting) and increased amylase activity in plasma (more than twofold above the upper limit of the reference interval).

Results

The overall success rate of bile duct cannulation was 97% in patients with access to the duodenum and papilla. The needle-knife approach was employed in 172 of 1,703 patients (10%), of whom 91 (53%) were jaundiced and 81 (47%) were nonjaundiced. The needle-knife assisted procedure was successful, leading to selective cannulation of the bile duct in 148 patients (86%) during the first endoscopy session. Of the 24 patients with a failed attempt, 10 underwent a successful repeat endoscopy within 2 to 7 days. Thus, altogether 158 of 172 patients (92%) with failure in cannulation attempts via the orifice of the papilla could undergo a selective bile duct cannulation after the needle-knife incision. In the remaining 14 patients (8%), after a failure even after the needle-knife technique, ERCP was not attempted again. Two of these patients had a large duodenal diverticulum, and in 12 patients a satisfactory endoscope position could not be achieved because of the anatomic structure of the duodenum and papilla.

In 45 patients, a regular sphincterotomy was also performed. Of these patients, 40 had bile duct stones, four had papillary stenosis and duct dilatation, and one had a villous adenoma of the papilla. Thirty-nine patients received a biliary stent because of a malignant biliary stricture, four patients underwent stent insertion for a benign biliary stricture, and one patient had a stent insertion for a biliary leakage after cholecystectomy. The needle-knife opening was sufficient for a 10 fr stent insertion in all patients. Four patients were examined for sclerosing cholangitis.

The occurrence and number of complications in patients with needle-knife assisted ERCPs are listed in Table 1.

Immediate bleeding from the needle-knife incision during the endoscopy occurred in 11 of 172 patients (6%). In three of them the bleeding was treated with an injection of epinephrine. In the rest of these patients the bleeding was estimated to stop spontaneously. None of these patients had clinical or laboratory signs of bleeding afterward.

Late bleeding was noticed in three of 172 patients (2%). One of these patients, a 24-year-old woman with gallbladder stones and suspicion of duct stones, who underwent the needle-knife incision but not a regular sphincterotomy, had significant late bleeding. She had to be readmitted to hospital and was treated with blood transfusions. The bleeding, however, stopped spontaneously and the recovery of the patient was uneventful thereafter. Two other patients received blood transfusions because of late bleeding. They had undergone a successful cannulation but also a regular sphincterotomy. One of them, a 65-year-old man, had permanent anticoagulation therapy, and in the endoscopy, a tumor of the papilla had been noted. The other patient was a 68-year-old woman, who underwent a stone extraction from bile ducts. Both patients underwent a repeat endoscopy, during which no active bleeding was noted.

Acute pancreatitis induced by needle-knife assisted ERCP occurred in three of 172 patients (2%). One of

Table 1. The occurrence and number (percentages) of complications in patients ($n = 72$) with needle-knife assisted endoscopic retrograde cholangiopancreatography

Complication	Number (percentage)
Immediate bleeding	11 (6%)
Late bleeding	3 (2%)
Acute pancreatitis	3 (2%)

these patients had also undergone a regular sphincterotomy and had postendoscopy bleeding (see above). She responded to conservative therapy with intravenous fluids and analgesics and could be discharged from hospital 8 days after the ERCP. The two other patients with acute pancreatitis were a 75-year-old woman and a 63-year-old man. The former had a failed cannulation attempt, but in the latter patient cannulation was successful. The indication for the examination in both patients was a suspicion of bile duct stones. Both were treated conservatively. They recovered uneventfully and could be discharged on the 8th and 7th day, respectively, in good general condition.

Contrast leakage into duodenal wall was noted in two patients during the ERCP. No clinically observed sequelae, however, followed.

None of the patients required an operation because of complications related to the needle-knife assisted ERCP and there was no mortality.

Discussion

The most usual problem at ERCP is difficulty in reaching a selective cannulation of the common bile duct. In these patients repeated contrast injections into the pancreatic duct should be avoided because of an increased risk for acute pancreatitis [3, 13]. The bile duct cannulation may be gained using a guide wire or a bendable cannula. When these techniques are successful, acute pancreatitis is very unlikely [10]. If, however, the bile duct cannot be cannulated with the aforementioned methods, the needle-knife approach is effective in the majority of patients. At present we use MicroKnife XL (Boston Scientific, IN, USA), which is a triple-lumen needle-knife. The correct technique is important for success and the prevention of complications. The repeated longitudinal strokes on the papilla with the needle-knife should be shallow enough not to penetrate too deeply, but dynamic, so that the needle would not adhere to tissue. The incision should be directed on the center and along the longitudinal axis of the papilla. The length of the incision on the mucosal surface is usually 5–8 mm. We use mixed (cutting 40 W/coagulating 4 W) continuous diathermy current. After incising through sphincter muscle tissue, the dorsal aspect of the intramural duct can usually be visualized. Now, the duct may be entered after a minimally short incision, or puncture with the needle-knife. As soon as the bile duct lumen has been reached, a cannula or a guide wire is inserted. If doubt exists whether the tip of the cannula is in the

correct position, we recommend inserting a guide wire. Injection of contrast may result in extravasation, which will jeopardize further cannulation attempts and also worsens the quality of radiologic imaging. In some instances the needle-knife incision may be incomplete, leaving a thin film of tissue, and the penetration into the duct lumen is carried out by repeated gentle thrusts with the tip of the cannula. We do not extend the incision to the papillary orifice, but rather towards the neck of the papilla. This method is also referred to as a fistulotomy [11]. In our patients, the opening created this way has been sufficient for the insertion of a 10 fr biliary stent, but for a stone extraction it should be widened. For this purpose, the needle-knife may be used, but usually a standard sphincterotome is required. We agree with other authors that these procedures should be performed only by, or at least under supervision, of an expert [1, 2].

In our patients, the rate of post-ERCP pancreatitis after the needle-knife assisted ERCP was 2%. So, our results confirm previous reports of a low risk for acute pancreatitis connected to the needle-knife technique [3, 11] and emphasize, in particular, the role of the fistulotomy technique in preventing the occurrence of post-ERCP pancreatitis. We believe that this is due to avoiding repeated contrast injections and manipulation of the intramural part and orifice of the pancreatic duct. In our opinion, this fact should encourage the endoscopist to consider an early conversion of the standard cannulation attempt into a fistulotomy type needle-knife incision, if a cannula or a guide wire is repeatedly directed into the pancreatic duct.

The most common problem related to needle-knife incision is bleeding, which usually is a result of incorrect use of the needle-knife, an inappropriately deep or maldirected incision. The bleeding, however, usually ceases spontaneously or is easily controlled endoscopically. When hemostatic therapy is indicated we use injections of epinephrine. Therefore, although seldom needed, one should have instruments for hemostasis at hand when performing needle-knife assisted ERCP. The need for postendoscopy observation depends on the evaluation of the endoscopist. After an adequately performed needle-knife ERCP, the risk for bleeding is slight, according to the earlier literature [5, 12] and our results. In our patients late bleeding occurred only in one patient, who underwent a needle-knife sphincterotomy but not a regular sphincterotomy. In patients with a distorted anatomy or a very small papilla, the success with the needle-knife technique is uncertain and, if the attempts are too vigorous or long-lasting, problems may arise. In 10 of our patients the primary session using the needle-knife was unsuccessful, but in a re-endoscopy 2–7 days later, cannulation could be performed. We believe

that this kind of consideration and “time-out” is of utmost importance in difficult cases. Also in this respect, our experiences are in accordance with reports from other centers [6, 9].

In conclusion, the results of the present study support the view that the needle-knife is an important and safe tool in ERCP procedures. We have not hesitated to use needle-knife even in nonjaundiced patients. Long-term follow-up has not shown any adverse effects of needle-knife assisted ERCP. In our opinion, it can be recommended as a routine practice in improving the success rate of selective biliary cannulation, particularly in patients with failing standard cannulation attempts via the orifice of the papilla.

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