NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

INTERVENTIONAL PROCEDURES PROGRAMME

Interventional procedure overview of endoscopic bipolar radiofrequency ablation for treating biliary obstructions caused by cholangiocarcinoma or pancreatic adenocarcinoma

Using radiofrequency energy to treat malignant bile or pancreatic duct obstructions caused by cholangiocarcinoma or pancreatic adenocarcinoma

Bile duct cancers and pancreas cancers can cause obstructions and block the ducts that carry digestive juices from the gall bladder and pancreas to the small intestine. This can cause a number of symptoms including jaundice, nausea, bloating and abdominal pain. Often this is treated by inserting small tubes called stents, which help to keep the ducts open and draining properly. However, these stents can become blocked and need replacing, which may be difficult. This procedure uses heat energy both to clear the duct obstructions before inserting stents, and to clear blocked stents.

Introduction

The National Institute for Health and Care Excellence (NICE) has prepared this overview to help members of the Interventional Procedures Advisory Committee (IPAC) make recommendations about the safety and efficacy of an interventional procedure. It is based on a rapid review of the medical literature and specialist opinion. It should not be regarded as a definitive assessment of the procedure.

Date prepared

This overview was prepared in November 2012.

Procedure name

Endoscopic bipolar radiofrequency ablation for treating biliary obstructions caused by cholangiocarcinoma or pancreatic adenocarcinoma
Specialist societies

Association of Upper Gastrointestinal Surgeons of Great Britain and Northern Ireland (Hepatobiliary Pancreatic Branch of AUGIS)
British Society of Gastroenterology
British Society of Gastrointestinal and Abdominal Radiology.

Description

Indications and current treatment

Cholangiocarcinoma or pancreatic adenocarcinoma causing obstruction of the bile or pancreatic ducts causes symptoms resulting from obstruction of the flow of bile and pancreatic juice into the duodenum including jaundice, nausea, bloating and abdominal pain. Surgical resection is often not possible.

Current management of patients with unresectable cholangiocarcinoma or pancreatic cancer include biliary stenting during endoscopic retrograde cholangiopancreatography (ERCP), chemotherapy, biological therapies (for example monoclonal antibodies), radiation therapy and photodynamic therapy. Stents often need to be replaced because of blockage by tumour ingrowth and this may be difficult.

What the procedure involves

Endoscopic radiofrequency ablation uses heat energy to ablate malignant tissue that is obstructing the bile or pancreatic ducts. This may be done before inserting stents or to clear obstructed stents.

The procedure is done with the patient under sedation, using fluoroscopic guidance, during ERCP. ERCP is first performed to confirm the length, diameter and position of the stricture. Under endoscopic visualisation, a bipolar endoscopic radiofrequency ablation catheter is deployed over a guide wire across the stricture. Controlled pulses of radiofrequency energy delivered by a radiofrequency generator are applied to obstructing tumour tissue to ablate it and to allow insertion of a stent, and/or to clear the lumen of a previously placed stent. Sequential applications are applied throughout the length of the stricture in order to achieve recanalisation. Repeat treatments may be used if obstruction recurs.

Literature review

Rapid review of literature

The medical literature was searched to identify studies and reviews relevant to endoscopic bipolar radiofrequency ablation for treating malignant biliary obstructions caused by cholangiocarcinoma or pancreatic adenocarcinoma.
Searches were conducted of the following databases, covering the period from their commencement to 15 November 2012: MEDLINE, PREMEDLINE, EMBASE, Cochrane Library and other databases. Trial registries and the Internet were also searched. No language restriction was applied to the searches (see appendix C for details of search strategy). Relevant published studies identified during consultation or resolution that are published after this date may also be considered for inclusion.

The following selection criteria (table 1) were applied to the abstracts identified by the literature search. Where selection criteria could not be determined from the abstracts the full paper was retrieved.

### Table 1 Inclusion criteria for identification of relevant studies

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication type</td>
<td>Clinical studies were included. Emphasis was placed on identifying good quality studies. Abstracts were excluded where no clinical outcomes were reported, or where the paper was a review, editorial, or a laboratory or animal study. Conference abstracts were also excluded because of the difficulty of appraising study methodology, unless they reported specific adverse events that were not available in the published literature.</td>
</tr>
<tr>
<td>Patient</td>
<td>Patients with malignant biliary obstructions from cholangiocarcinoma or pancreatic adenocarcinoma.</td>
</tr>
<tr>
<td>Intervention/test</td>
<td>Endoscopic bipolar radiofrequency ablation.</td>
</tr>
<tr>
<td>Outcome</td>
<td>Articles were retrieved if the abstract contained information relevant to the safety and/or efficacy.</td>
</tr>
<tr>
<td>Language</td>
<td>Non-English-language articles were excluded unless they were thought to add substantively to the English-language evidence base.</td>
</tr>
</tbody>
</table>

### List of studies included in the overview

This overview is based on 22 patients from 1 case series and 1 case report\(^1,2\).

Other studies that were considered to be relevant to the procedure but were not included in the main extraction table (table 2) have been listed in appendix A.
### Table 2 Summary of key efficacy and safety findings on endoscopic bipolar radiofrequency ablation for treating malignant biliary obstructions caused by cholangiocarcinoma or pancreatic adenocarcinoma

<table>
<thead>
<tr>
<th>Study details</th>
<th>Key efficacy findings</th>
<th>Key safety findings</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Steel AW (2011)</strong></td>
<td><strong>Successful deployment of endoscopic RFA catheter:</strong> Deployment of an RFA catheter was successful in 95% (21/22) of patients. The unsuccessful deployment occurred in 1 patient in whom there was an irretrievable proximal migration of a previously placed plastic stent.</td>
<td><strong>Immediate, 30- and 90-day complications</strong></td>
<td><strong>Follow-up issues:</strong> Complete follow-up</td>
</tr>
<tr>
<td><strong>Prospective case series (cohort study)</strong></td>
<td><strong>RFA procedure details (n=21)</strong></td>
<td></td>
<td><strong>Study design issues:</strong> First study in human subjects. Single tertiary care unit, open-label pilot study to demonstrate efficacy and safety. Serial liver function tests and imaging determined biliary obstruction after ERCP.</td>
</tr>
<tr>
<td>UK</td>
<td>Procedure time, min, mean (range)</td>
<td>Asymptomatic biochemical pancreatitis (amylase 1450 U/l) after ERCP</td>
<td><strong>Study population issues:</strong> 7 patients had sepsis at RFA ERCP. 16 patients had plastic stents (typically 7F or 10F) before SEMS. All had a biliary stricture diameter less than that of 8F RFA catheter at ERCP, ensuring tight contact between the probe and malignant stricture. 6 patients had hepatic hilar or intrahepatic involvement, 3 of these underwent balloon dilation of the stricture to facilitate further instrumentation. 1 patient had 2 SEMSs inserted at a hilar stricture with RFA applied for each stent.</td>
</tr>
<tr>
<td>Recruitment period: 2009–2010</td>
<td>Fluoroscopic screening time, min, median (range)</td>
<td>Cholecystitis requiring percutaneous gallbladder drainage (both had tumour encasement of the cystic duct on CT and sepsis before ERCP)</td>
<td><strong>Other issues:</strong> Blood tests demonstrating systemic inflammatory response to RFA were not measured.</td>
</tr>
<tr>
<td>Study population: patients with unresectable malignant pancreatic or bile duct obstruction n=22 (16 pancreatic, 6 cholangiocarcinoma) (10 metastatic, 17 locally advanced, 7 metastatic and locally advanced)</td>
<td>No. of applications, median (range)</td>
<td>Rigors after ERCP (resolved after antibiotic therapy)</td>
<td></td>
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<tr>
<td>Bilirubin mmol/l: median 26, Karnofsky score: median 55.</td>
<td>Total energy delivered, J, mean (range)</td>
<td></td>
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<tr>
<td>Age: mean 70 years</td>
<td>Stricture diameter before RFA, mm, median (range)</td>
<td></td>
<td></td>
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<tr>
<td>Sex: 50% (11/22) male</td>
<td>Stricture diameter after RFA, mm, median (range)</td>
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<td></td>
</tr>
<tr>
<td>Patient selection criteria: patients with unresectable pancreatic or bile duct cancer</td>
<td>Length of stricture, mm, mean (range)</td>
<td></td>
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<tr>
<td>Exclusion criteria: uncorrected coagulopathy, cardiac pacemaker, failure to insert guide wire across a biliary stricture, Karnofsky score less than 40% and inability to give informed consent.</td>
<td>After ERCP day stay, d, median (range)</td>
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<td>Technique: ERCP with an RFA catheter was performed by 2 experienced pancreatobiliary endoscopists prior to insertion of SEMS. ERCP performed under standard operating conditions with Olympus TJF-260 duodenoscopes. Previously placed stents within the bile duct were first removed to confirm biliary stricture length,</td>
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<tr>
<td><strong>Follow-up issues:</strong> Complete follow-up</td>
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<tr>
<td><strong>Study design issues:</strong> First study in human subjects. Single tertiary care unit, open-label pilot study to demonstrate efficacy and safety. Serial liver function tests and imaging determined biliary obstruction after ERCP.</td>
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<tr>
<td><strong>Study population issues:</strong> 7 patients had sepsis at RFA ERCP. 16 patients had plastic stents (typically 7F or 10F) before SEMS. All had a biliary stricture diameter less than that of 8F RFA catheter at ERCP, ensuring tight contact between the probe and malignant stricture. 6 patients had hepatic hilar or intrahepatic involvement, 3 of these underwent balloon dilation of the stricture to facilitate further instrumentation. 1 patient had 2 SEMSs inserted at a hilar stricture with RFA applied for each stent.</td>
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<td><strong>Other issues:</strong> Blood tests demonstrating systemic inflammatory response to RFA were not measured.</td>
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</tbody>
</table>

Abbreviations used: CT, computed tomography; ERCP, endoscopic retrograde cholangiopancreatography; RFA, radiofrequency ablation; SEMS, self-expandable metal stent; W, Watts.
Abbreviations used: CT, computed tomography; ERCP, endoscopic retrograde cholangiopancreatography; RFA, radiofrequency ablation; SEMS, self-expandable metal stent; W, Watts.

<table>
<thead>
<tr>
<th>Study details</th>
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<th>Key safety findings</th>
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</tr>
</thead>
<tbody>
<tr>
<td>diameter and position. The wire-guided Habib EndoHPB bipolar RFA catheter was placed under fluoroscopy within the biliary stricture. Ablation carried out using a RFA generator at 400 kHz set at 7 to 10 W for 2 minutes, with a rest period of 1 minute before moving the catheter. Depending on the length of the stricture, sequential applications were applied to ensure RFA treatment throughout the entire stricture. After RFA treatment, SEMS were deployed as per standard protocols.</td>
<td><strong>Successful SEMS placement</strong> SEMS placement was achieved in 100% (21/21) of cases of successful RFA catheter deployment.</td>
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<td><strong>Stent patency at 30 days</strong> 95% (20/21) of patients maintained stent patency at 30 days. The 1 patient who did not maintain patency at 30 days had been the only patient in whom there had been a failure to demonstrate biliary decompression after SEMS placement and further review showed significant intrahepatic biliary malignancy preventing biliary decompression.</td>
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<tr>
<td><strong>Survival and biliary patency at 90-days follow-up</strong> 76% (16/21) of patients were alive with biliary patency at 90 days (2 died, 3 developed further biliary obstruction).</td>
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</tbody>
</table>

Follow-up: 90 days

Conflict of interest/source of funding: 2 authors disclosed financial relationships. Ms Nicholls and Dr Habib are stockholders and board members of EMcision Ltd UK.

Authors state that ‘it is likely that the energy used in this study resulted in a deeper level of tissue damage’ and some damage to an adjacent healthy bile duct.
### Abbreviations used:
CT, computed tomography; ERCP, endoscopic retrograde cholangiopancreatography; RFA, radiofrequency ablation; SEMS, self-expandable metal stent; W, Watts.

<table>
<thead>
<tr>
<th>Study details</th>
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<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MAUDE adverse event report</strong></td>
<td></td>
<td>The patient was admitted for hospitalisation on the same day due to a hepatic artery aneurysm (pseudoaneurysm) arising from the central right hepatic artery. It was unclear if it was partially or completely within the liver or not because it was diagnosed by angiography not cross-sectional imaging. <strong>Outcome:</strong> Treatment with embolisation successfully stopped the haemorrhaging and the patient recovered. The patient was discharged on the same day.</td>
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<td>US FDA</td>
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<tr>
<td>Event Date: 03/19/2012</td>
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<tr>
<td>n=1</td>
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<tr>
<td>Device involved: Conmed RF Generator (CONMED RD Generator). No known device problem.</td>
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<tr>
<td>Event type: life-threatening injury</td>
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<tr>
<td>Event description: patient received ERCP with EndoHPB treatment including intraductal radiofrequency ablations in the right hepatic duct, left hepatic duct and the common hepatic duct/biliary confluence. Each RFA treatment was done using a Conmed RF generator at 10 W for 90 seconds; all completed in the same procedure on the same day. Patient received cholangioscopy with videoscope before and after EndoHPB treatment. Patient had a chronic left-sided hepatic percutaneous biliary drain which did not enter the right hepatic duct. Patient never had a right-sided biliary drain. Stents were not placed after the treatment.</td>
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</tbody>
</table>
**Efficacy**

**Successful deployment of an endoscopic radiofrequency ablation catheter**

A case series of 22 patients reported that deployment of an endoscopic radiofrequency ablation catheter was successful in 95% (21/22) of patients. The one unsuccessful deployment occurred because of irretrievable proximal migration of a previously placed plastic stent\(^1\).

**Successful self-expandable metal stent (SEMS) placement**

The case series of 22 patients reported that SEMS placement was achieved after endoscopic radiofrequency ablation in 100% (21/21) of cases of successful catheter deployments\(^1\).

**Stent patency**

The case series of 22 patients reported that stent patency was maintained in 95% (20/21) of patients at 30 days follow-up (1 patient developed further biliary obstruction), and 76% (16/21) of patients at 90 days follow-up (2 had died, 3 developed further biliary obstruction)\(^1\).

**Safety**

**Mortality**

Death within 90 days was reported in 10% (2/21) of patients in a case series of 22 patients. One patient died after biliary decompression by SEMS placement could not be achieved and the other patient died as a result of disease progression with a patent stent\(^1\).

**Hepatic artery aneurysm**

A hepatic artery pseudoaneurysm, arising from the central right hepatic artery, occurred in 1 patient in whom ERCP with radiofrequency ablation catheter treatment was performed in the right hepatic duct, left hepatic duct and the common hepatic duct biliary confluence. It was unclear if the aneurysm was partially or completely within the liver. Treatment with embolisation successfully stopped the haemorrhage and the patient recovered. This adverse event was reported in the Manufacturer and User Facility Device Experience (MAUDE) US Food and Drug Administration (FDA) database\(^2\).

**Pancreatitis**

Asymptomatic biochemical pancreatitis developed after ERCP in 1 patient in the case series of 22 patients\(^1\).
Cholecystitis

Cholecystitis needing percutaneous gallbladder drainage was reported in 10% (2/21) of patients in the case series of 22 patients. Both patients had tumour encasement of the cystic duct and sepsis before ERCP.

Rigors

Rigors developed in 1 patient after ERCP in the case series of 22 patients. These resolved after antibiotic therapy.

Validity and generalisability of the studies

Only 1 small case series has been published on this procedure.

Duration of follow-up is relatively short (up to 90 days).

Treatment in patients with metastatic disease is palliative in purpose and longer-term outcomes will depend on underlying disease progression.

Existing assessments of this procedure

There were no published assessments from other organisations identified at the time of the literature search.

Related NICE guidance

Below is a list of NICE guidance related to this procedure. Appendix B gives details of the recommendations made in each piece of guidance listed.

Interventional procedures

**Specialist Advisers’ opinions**

Specialist advice was sought from consultants who have been nominated or ratified by their Specialist Society or Royal College. The advice received is their individual opinion and does not represent the view of the society.

Dr Stephen Pereira (British Society of Gastroenterology), Mr Richard Sturgess (Association of Upper Gastrointestinal Surgeons of Great Britain & Ireland).

- One Specialist Adviser stated that the title of the procedure is not adequate and recommended to use the word ‘unresectable’ in the title: Endoscopic bipolar radiofrequency ablation for the treatment of unresectable malignant biliary obstructions from cholangiocarcinoma or pancreatic adenocarcinoma.
- One Adviser has performed the procedure while another Adviser took part only in patient selection or referral.
- Both Advisers have undertaken bibliographic research and one of them developed a protocol and grant application for endoscopic ultrasound-guided radiofrequency ablation of pancreatic lesions that is currently under review.
- Both Advisers considered the procedure to be novel and of uncertain efficacy and safety.
- One Adviser stated that the relevant comparator would be stenting alone of malignant biliary strictures, while another Adviser stated that effective biliary drainage with the placement of plastic or self-expanding metal stents, followed by chemotherapy if appropriate for the individual patient, is the standard care for non-resectable malignant bile-duct obstruction. He also noted that the only comparator in terms of endoscopic intra-ductal therapy is photodynamic therapy.
- Both Advisers stated that less than 10% of specialists are engaged in this area of work.
- The key efficacy outcomes include survival, stent patency, frequency of cholangitis, need for further biliary intervention and quality of life. One Adviser stated that the main uncertainty is about the additional benefit of RFA over insertion of self-expanding metal stents alone. He also noted that there was
uncertainty about the reproducibility of the procedure. One Adviser stated that there are no randomised trials to demonstrate the efficacy of this procedure.

- The theoretical adverse events include cholangitis, cholecystitis, pancreatitis, stent occlusion, damage to surrounding tissue, causing perforation of bile duct, biliary leak, abscess formation and portal vein thrombosis.
- The listed anecdotal events include pancreatitis, cholangitis, cholecystitis and probe breakage inside patient.
- Both Advisers stated that no additional training and facilities are needed over those required for advanced ERCP procedures, other than familiarity with manipulation and placement of the probe and proper use of the radiofrequency generator. One Adviser stated that the procedure is simple for an experienced biliary endoscopist to undertake.
- One Adviser stated that a phase II multicentre RCT is being set up by EndoHPB UK. The chief investigators are Dr David Westaby and Professor Nagy Habib. He also stated that recently presented abstracts on this procedure can be found in the Digestive Diseases Week 2012 abstracts.
- One Adviser stated that, given the relative ease of use, this procedure could be taken up inappropriately by units or individuals who do not have the appropriate skill or knowledge base to use the technique safely and appropriately.
- Both Advisers stated that this is a technically straightforward and relatively cheap and widely applicable procedure that is likely to be taken up by most HPB/ERCP centres if randomised data confirm efficacy in terms of improved stent patency. They stated that this procedure is likely to be carried out in a minority of hospitals (at least 10) in the UK at the discretion of multidisciplinary teams and the potential impact on the NHS would be minor. One Adviser noted that approximately 8000 patients are diagnosed with pancreatic cancer and 2000 with biliary cancer each year, of whom perhaps 10–20% (1000–2000) would be expected to have sufficiently locally advanced, slowly progressive disease so that recurrent stent occlusion may be a factor and RFA potentially indicated. He stated that patients eligible for treatment might
increase up to 80% if RFA at diagnosis is shown to be beneficial in all subgroups of patients with unresectable disease.

**Patient Commentators’ opinions**

NICE’s Patient and Public Involvement Programme was unable to gather patient commentary for this procedure.

**Issues for consideration by IPAC**

Studies on endoscopic RFA catheter for ablation of obstructing pancreatic or biliary tumours are limited

Future trials:

- **NCT01303159**: Endoscopic Bipolar Radiofrequency Probe (ENDOHPB) in the Management of Unresectable Bile Duct and Pancreatic Cancer; study type: case series; location: USA; estimated enrolment: 47; estimated completion date: March 2013.
- **NCT01439698**: Radio Frequency Ablation in the Management of Pancreatico-biliary Disorders: A Multicenter Registry (RFA-Registry); study type: non-randomised study; location: USA; estimated enrolment: 200; estimated completion date: September 2015. This study is ongoing.
- **NCT01543607**: Endoscopic Therapy of Malignant Bile Duct Strictures; study type: case series; location: USA; estimated enrolment: 10; estimated completion date: April 2014. This study is currently recruiting participants.
- **NCT01721174**: Endoscopic Biliary Radiofrequency Ablation of Malignant Distal Common Bile Duct Strictures; study type: Randomised controlled trial comparing the efficacy of EBRFA with the addition of SEMS to SEMS alone; location: Hong Kong; estimated enrolment: 116; estimated completion date: November 2015. This study is currently recruiting.
References


Appendix A: Additional papers on endoscopic bipolar radiofrequency ablation for treating malignant biliary obstructions caused by cholangiocarcinoma or pancreatic adenocarcinoma

The following table outlines the studies that are considered potentially relevant to the overview but were not included in the main data extraction table (table 2). It is by no means an exhaustive list of potentially relevant studies.

<table>
<thead>
<tr>
<th>Article</th>
<th>Number of patients/follow-up</th>
<th>Direction of conclusions</th>
<th>Reasons for non-inclusion in table 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Itoi T et al. (2011). Evaluation of effects of a novel endoscopically applied radiofrequency ablation biliary catheter using an ex-vivo pig liver. Journal of Hepatobiliary Pancreatic Sciences Oct 25 1-5.</td>
<td>Case series n=11 Patients with advanced hepatopancreato-biliary malignancy (6 pancreatic, 3 cholangiocarcinoma, 2 hepatic metastases) Technique: endoscopic RFA directly within the lumen of occluded biliary SEMS at ERCP to restore stent patency. Follow-up: median 131 days</td>
<td>Successful deployment of catheter in all. Procedure well tolerated and no associated significant adverse events or morbidity. RFA helped re-establish stent patency in all except 1 with disseminated metastatic pancreatic carcinoma. Median stent patency post RFA was 146 days. Stent re-occlusion occurred in 5 of 11 patients over a median follow-up of 131 days, 4 of whom were treated with repeat RFA.</td>
<td>Pre-clinical study.</td>
</tr>
<tr>
<td>Kallis Y et al. (2012). Radiofrequency ablation for biliary metal stent occlusion: Evolution of a novel endoscopic technique and proof of concept. Gastrointestinal Endoscopy. Conference: Digestive Disease Week 2012, DDW 2012 San Diego, CA United States. Conference Start: 20120519 Conference End: 20120522. Conference Publication: (var. pagings) 75 (4 SUPPL.1) (pp AB377-AB378).</td>
<td>Case series n=5 Patients with advanced non-resectable biliary malignancy (4 primary cholangiocarcinoma, 1 had a biliary implant of colon adenocarcinoma of the left hepatic duct) Technique: EndoHPB RFA using a electrosurgical generator with ERCP and stent placement. Follow-up: not reported</td>
<td>7 strictures ablated in 5 patients.1 patient had a second ablation 3 months later. Ablation successful in all cases.4 plastic and 1 SEMS were placed after ablation. Complications of cholangitis, cholecystitis, pancreatitis, biliary perforation, bleeding, and enteral perforation did not occur. All 5 patients were alive awaiting repeat treatment sessions.</td>
<td>Conference Abstract (no complications reported).</td>
</tr>
<tr>
<td>Study</td>
<td>Case Report/Case Series</td>
<td>Technique</td>
<td>Follow-up</td>
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<tr>
<td>Mavrogenis G et al. (2012). Bile duct adenoma causing recurrent cholangitis: diagnosis and management with targeted spyglass access and radiofrequency ablation. Endoscopy E290-E291</td>
<td>Case report n=1 Patient with bile duct adenoma causing recurrent cholangitis</td>
<td>Technique: diagnosis and management with targeted spyglass access and endoscopic radiofrequency ablation of the stricture 4 weeks later. Follow-up: not reported</td>
<td>The stricture was dilated with a Hurricane 8-mm, 4-cm balloon and the stones were extracted. The Spyscope was removed and two 7-Fr plastic stents placed.</td>
</tr>
<tr>
<td>Monga A, Gupta R, Ramchandani M et al. (2011). Endoscopic radiofrequency ablation of cholangiocarcinoma: New palliative treatment modality (with videos). Gastrointestinal Endoscopy 74 (4) pp 935-937.</td>
<td>Case report n=1 Patient with unresectable cholangiocarcinoma (with 1 month history of jaundice and weight loss)</td>
<td>Technique: ERCP with wire guided Habib EndoHPB catheter Follow-up=2 weeks</td>
<td>Immediate posttreatment images showed an ablated tumour with whitish coagulated mucosa. The patient was discharged next day without any complications. Two weeks later, cholangioscopy demonstrated persistent whitish charred mucosa with well-defined proximal and distal ablated edges. The 11F cholangioscope could easily pass across the stricture, and a cholangiogram confirmed its significant resolution.</td>
</tr>
<tr>
<td>Steel A et al. (2010). The use of a novel endoscopically placed radiofrequency probe for the management of malignant bile duct obstruction. Gastrointestinal Endoscopy. Conference: Digestive Disease Week 2010 New Orleans, LA United States. Conference Start: 20100501 Conference End: 20100505. Conference Publication: (var. pagings 71 (5) (pp AB321).</td>
<td>Case series n=15 Patients with unresectable pancreatic or bile duct cancer.</td>
<td>Technique: ERCP with wire guided Habib EndoHPB catheter followed by placement of SEMS. Follow-up: 30 days</td>
<td>Deployment of the catheter was successful in all but 1 patient who had proximal migration of a previously placed plastic stent. SEMS placement was successful in all who had endoscopic RFA. Post ERCP, mild pancreatitis noted in 1, tumour related gall bladder collection requiring cholecystostomy in 1. 30 day patency maintained in all patients. 1 patient died with a patent stent within 30 days due to progressive disease.</td>
</tr>
</tbody>
</table>

**IP overview:** endoscopic bipolar radiofrequency ablation for treating biliary obstructions caused by cholangiocarcinoma or pancreatic adenocarcinoma
<table>
<thead>
<tr>
<th>Tran T et al (2007). Successful endoscopic management of bronchobiliary fistula due to radiofrequency ablation. Digestive Diseases and Sciences 52 (11), pp 3178-3180.</th>
<th>Case report n=1 Patient with colon cancer and metastatic lesions. Intraoperative RFA. Follow-up: 3 months</th>
<th>Patient had a bronchial fistula as a complication of RFA. ERCP showed extravasation of contrast into the right lung. Sphincterectomy performed and a stent placed, one month later stent occluded and was replaced. 3 months later patient died from multiple metastases of liver and lungs.</th>
<th>Not endoscopic RFA.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watson J and Habr F (2012). Safety and efficacy of endoscopic radiofrequency ablation in non-resectable cholangiocarcinoma: A case series. American Journal of Gastroenterology Conference: 77th Annual Scientific Meeting of the American College of Gastroenterology Las Vegas, NV United States. Conference Start: 20121019 Conference End: 20121024. Conference Publication: (var. pagings) 107 (pp S (var. pagings) S78.</td>
<td>Case series n=3 Patients with non-resectable hilar cholangiocarcinoma underwent ERCP and endoscopic bipolar RFA using a EndoHPB at either 7 or 10W for 90 seconds. 2 patients had SEMS placed and 1 had 2 bilateral plastic stents. Repeat ERCP done at mean 89 days. Follow-up: not reported</td>
<td>There were no procedure related complications. There was significant reduction in bilirubin. At repeat ERCP, cholangiogram showed marked improvement of the malignant stricture diameter from &lt;3 to 6mm. A 12 mm extraction balloon was pulled through the stricture with minimal resistance.</td>
<td>No complications reported.</td>
</tr>
</tbody>
</table>
Appendix B: Related NICE guidance for endoscopic bipolar radiofrequency ablation for treating malignant biliary obstructions caused by cholangiocarcinoma or pancreatic adenocarcinoma

<table>
<thead>
<tr>
<th>Guidance</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
1.1 Current evidence on the safety of selective internal radiation therapy (SIRT) for non-resectable colorectal metastases in the liver is adequate.  
1.2 The evidence on its efficacy in chemotherapy-naive patients is inadequate in quantity. Clinicians should offer eligible patients who have not been previously treated by chemotherapy entry into well-designed research studies such as the FOXFIRE trial ([www.octo-oxford.org.uk/alltrials/trials/FOXFIRE](http://www.octo-oxford.org.uk/alltrials/trials/FOXFIRE)). For patients who are not eligible or who prefer not to enter a research trial, the procedure should be used with special arrangements for clinical governance, consent and audit.  
1.3 For patients who have previously been treated with chemotherapy, there is evidence that SIRT can prolong time to progression of hepatic metastases, but more evidence is required on survival and quality of life (see section 1.7). Therefore for patients who have been previously treated with chemotherapy this procedure should be used with special arrangements for clinical governance, consent and audit.  
1.4 Clinicians undertaking the procedure for patients outside research studies should take the following actions.  
   - Inform the clinical governance leads in their Trusts.  
   - Ensure that patients and their carers understand the uncertainty about the procedure’s efficacy and provide them with clear written information. In addition, the use of NICE’s information for patients (‘Understanding NICE guidance’) is recommended (available from [www.nice.org.uk/guidance/IPG401/publicinfo](http://www.nice.org.uk/guidance/IPG401/publicinfo)).  
   - Audit and review clinical outcomes of all patients having SIRT for non-resectable colorectal metastases (see section 3.1).  
1.5 Patients should be selected for SIRT or entry into trials by a hepatobiliary cancer multidisciplinary team including an interventional radiologist, in liaison with a colorectal cancer multidisciplinary team.  
1.6 SIRT should only be carried out by clinicians with specific training in its use and in techniques to minimise the risk of side effects of the procedure.  
1.7 The Committee considered that SIRT is a potentially beneficial...
treatment for patients with non-resectable colorectal metastases in the liver, but that more research and data collection are required to demonstrate its efficacy. A recommendation about research trials for chemotherapy-naive patients is given in 1.2 above. For patients who have previously been treated with chemotherapy, comparative trials are needed to determine whether SIRT prolongs survival compared with best standard treatment, and to determine its effect on quality of life. There is also a need to identify which subgroups of patients are likely to derive clinical benefit from SIRT. Research studies should clearly describe the characteristics of treated patients, and the extent and histological details of their tumours. Outcomes should include survival and quality of life. Downstaging of metastases allowing resection or ablation should be clearly documented.

1.8 NICE may review the procedure on publication of further evidence.


1.1 Current evidence on the safety and efficacy of photodynamic therapy (PDT) for bile duct cancer does not appear adequate for this procedure to be used without special arrangements for consent and for audit or research.

1.2 Clinicians wishing to undertake PDT for bile duct cancer should take the following actions:

- Inform the clinical governance leads in their Trusts.
- Ensure that patients understand the uncertainty about the procedure’s safety and efficacy and provide them with clear written information. Use of the Institute’s information for the public is recommended.
- Audit and review clinical outcomes of all patients having PDT for bile duct cancer.

1.3 Publication of safety and efficacy outcomes will be useful. A randomised trial (PHOTOSTENT 2) is in progress and clinicians are encouraged to enter patients in this trial. The Institute may review the procedure upon publication of further evidence.


1.1 Endoscopic transluminal pancreatic necrosectomy shows the potential for serious complications. Evidence on small numbers of patients shows that endoscopic transluminal pancreatic necrosectomy is efficacious, but repeated procedures are often required. This procedure should only be used with special arrangements for clinical governance, consent and audit or research.

1.2 Clinicians wishing to undertake endoscopic transluminal pancreatic necrosectomy should take the following actions:
• Inform the clinical governance leads in their Trusts.
• Ensure that patients understand the uncertainty about the procedure's safety and efficacy and provide them with clear written information. In addition, the use of NICE's information for patients (Understanding NICE guidance) is recommended.
• Audit and review clinical outcomes of all patients having endoscopic transluminal pancreatic necrosectomy (see section 3.1).

1.3 Endoscopic transluminal pancreatic necrosectomy should only be carried out by a team experienced in the management of complex pancreatic disease.

1.4 Further publication of data on the outcomes of patients treated by endoscopic transluminal pancreatic necrosectomy is encouraged. This should include clear documentation of patient characteristics, numbers of procedures required, complications and survival.

1.5 NICE may review this procedure on publication of further evidence.


1.1 Current evidence on the safety and efficacy of irreversible electroporation for treating pancreatic cancer is inadequate in quantity and quality. Therefore, this procedure should only be used in the context of research. In particular, studies should report the effect of the procedure on local tumour control and patient survival.


1.1 Current evidence on the safety and efficacy of irreversible electroporation for treating primary liver cancer is inadequate in quantity and quality. Therefore, this procedure should only be used in the context of research. In particular, studies should report the effect of the procedure on local tumour control and patient survival.
Appendix C: Literature search for endoscopic bipolar radiofrequency ablation for treating malignant biliary obstructions caused by cholangiocarcinoma or pancreatic adenocarcinoma

<table>
<thead>
<tr>
<th>Database</th>
<th>Date searched</th>
<th>Version/files</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cochrane Database of Systematic Reviews – CDSR (Cochrane Library)</td>
<td>15/11/12</td>
<td>Issue 11 of 12, November 2012</td>
</tr>
<tr>
<td>Database of Abstracts of Reviews of Effects – DARE (CRD website)</td>
<td>15/11/12</td>
<td>Issue 11 of 12, November 2012</td>
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<td>HTA database (CRD website)</td>
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<td>Issue 11 of 12, November 2012</td>
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<tr>
<td>Cochrane Central Database of Controlled Trials – CENTRAL (Cochrane Library)</td>
<td>15/11/12</td>
<td>Issue 11 of 12, November 2012</td>
</tr>
<tr>
<td>MEDLINE (Ovid)</td>
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<td>1946 to November Week 1 2012</td>
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<td>MEDLINE In-Process (Ovid)</td>
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<td>CINAHL (NLH Search 2.0/EBSCOhost)</td>
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</tr>
<tr>
<td>BLIC</td>
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</tr>
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</table>

The following search strategy was used to identify papers in MEDLINE. A similar strategy was used to identify papers in other databases.

**MEDLINE search strategy**

```
1 *endoscopy/mt
2 *Endoscopes/
3 (endoscop* or scope*).tw.
4 or/1-3
5 *catheter ablation/mt
6 (catheter* adj3 ablat*).tw.
7 (radiofrequen* adj3 ablat*).tw.
8 (radio frequen* adj3 ablat*).tw.
9 (radio-frequen* adj3 ablat*).tw.
10 RFA.tw.
```
IP overview: endoscopic bipolar radiofrequency ablation for treating biliary obstructions caused by cholangiocarcinoma or pancreatic adenocarcinoma