

## Original research

# Impact of COVID-19 pandemic on key performance indicators in pancreatobiliary endoscopy: prioritise, minimise risk, keep scoping and training

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## ABSTRACT

**Background** The COVID-19 pandemic has profoundly affected endoscopy services including pancreatobiliary (PB) endoscopy across the UK. The British Society of Gastroenterology and Joint Advisory Group have issued guidance for managing endoscopy services safely throughout this period. There have been perceived concerns among the PB endoscopists that wearing full personal protective equipment might have an adverse impact on key performance indicators (KPIs) in endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound (EUS) procedures leading to non-compliance with the national guidelines. The aim of the study was to assess the impact of COVID-19 pandemic on KPIs in ERCP and EUS and ascertain the risk of procedure-related complications.

**Methods** A retrospective audit of a prospectively maintained endoscopy database was carried out between 18 March and 31 July 2020.

**Results** 146 ERCP procedures (common bile duct (CBD) cannulation rate of naïve papilla 89.2%, complete CBD stone extraction rate at first ERCP 88.2%, biliary stricture decompression rate 91%) and 87 EUS procedures (diagnostic accuracy of EUS-fine needle aspiration 92%) were carried out during this period. ERCP-related complications included pancreatitis (4.8%), bleeding (0.68%) and cholangitis (0.68%). 30-day ERCP procedure-related mortality was 0.68%. There were no complications or procedure-related mortality in the EUS group.

**Conclusion** This is the first study looking at the impact of COVID-19 on KPIs and procedure-related complications in ERCP and EUS in the literature. Our study confirms that a high-quality

## Significance of this study

### What is already known on this topic

- ▶ The COVID-19 pandemic has profoundly affected endoscopy services across the UK.
- ▶ The British Society of Gastroenterology (BSG) and Joint Advisory Group (JAG) have issued guidance for managing endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound (EUS) services safely throughout this pandemic.
- ▶ The BSG and JAG had previously published guidance on key performance indicators and procedure-related complications in ERCP and EUS.

### What this study adds

- ▶ COVID-19 had no adverse impact on key performance indicators for ERCP and EUS procedures.

### How might it impact on clinical practice in the foreseeable future

- ▶ This study highlights the importance of strict consultant prioritisation of all ERCP and EUS procedures, robust patient work-up, detailed prelist team huddle with clear planning of therapy and efficient team working for delivering a safe high-quality pancreatobiliary endoscopy service during the pandemic

PB endoscopy service can be delivered safely and effectively during the COVID-19 pandemic.

## BACKGROUND

In December 2019, the WHO reported isolation of a new SARS-CoV-2 from the Wuhan province in China.<sup>1</sup> The first cases of COVID-19 were confirmed on 31



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January 2020 in the UK.<sup>2</sup> On 23 March 2020, UK went into lockdown to protect the National Health Service (NHS) and save lives.<sup>3</sup> The COVID-19 pandemic peaked by mid-late April and the postpandemic phase continued thereafter.

Since mid-March 2020 in the UK, restrictions to normal clinical activity were introduced in the NHS to contain, delay and mitigate SARS-CoV-2 spread. The British Society of Gastroenterology (BSG) provided guidance for managing endoscopy services in the UK throughout the pandemic.<sup>3</sup> There was a significant reduction in endoscopy capacity during the first peak during March and April 2020 with overall endoscopic activity being 12% of pre-COVID levels at its lowest point.<sup>4</sup>

Endoscopic retrograde cholangiopancreatography (ERCP) is the endoscopic procedure of choice for biliary decompression. Endoscopic ultrasound (EUS) is an endoscopic procedure where an echoendoscope uses high-frequency ultrasound waves to produce detailed images of the lining of the gastrointestinal tract and nearby organs like the liver, pancreas and gall bladder. EUS can be used to obtain targeted biopsies from different organs and for drainage of collections as a minimally invasive procedure. For ERCP, acute biliary obstruction requiring stenting and cholangitis were deemed essential procedures by the BSG while EUS-guided drainage of infected pancreatic fluid collection was deemed as essential indication for EUS during the COVID-19 peak in the UK.<sup>5</sup> EUS-guided fine needle aspiration (FNA) cytology for cancer staging and treatment planning was also deemed as essential during the peak of COVID-19 pandemic if it was considered important to significantly impact treatment.<sup>5</sup>

ERCP activity reduced to 43.7% compared with the pre-COVID levels and was impacted to a lesser extent than other endoscopic procedures in the UK.<sup>4</sup>

In this article, we share our experience of the impact of COVID-19 in the endoscopic management of pancreatobiliary (PB) disorders during the peak and early recovery phase of COVID-19 in our institution.

## AIMS

The primary aims of our study were:

1. To assess the key performance indicators (KPIs) for ERCP/EUS procedures during the COVID-19 pandemic and compare it against the BSG guidelines.
2. To ascertain the risk of procedure-related complications and 30-day mortality during this period.

As a secondary endpoint, we aimed at assessing the number of patients with a positive SARS-CoV-2 nasopharyngeal swab in the 28 days following their ERCP/EUS procedure.

## METHODOLOGY

All ERCP/EUS procedures carried out from 18 March 2020 to 31 July 2020 in our institution were included in this study. 18 March was chosen as it was the onset

of pandemic in the UK. A retrospective analysis of a prospectively maintained endoscopy database was carried out to evaluate the impact of COVID-19 on PB endoscopy in our unit. Data collection included patient demographics, laboratory investigations, COVID-19 swab results, cross-sectional imaging, endoscopic intervention, complications, trainee participation and 30-day postprocedure mortality. Categorical variables were compared using Fisher's exact test. A  $p$  value  $<0.05$  was considered as statistically significant. Data were analysed using MedCalc V.12.7 (MedCalc Software, Ostend, Belgium).

At the beginning of the pandemic in March 2020, a symptom-based questionnaire (fever, new-onset cough, myalgia, shortness of breath) was used to screen patients for COVID-19 prior to their endoscopic procedures in our hospital. COVID-19 swabs were not carried out routinely prior to their endoscopic procedure during this period if patients did not present with COVID-19 symptoms. As some of the presenting symptoms for ERCP or EUS (fever, myalgia) might mimic COVID-19, we regarded all new ERCP/EUS referrals as potential COVID-19 risk in the standard operating procedure of our ERCP/EUS pathway.

Following BSG guidance,<sup>3</sup> from 18 May 2020, all patients who attended endoscopic procedures at University Hospital of North Tees underwent a SARS-CoV-2 nasopharyngeal swab 1–3 days prior to their procedures along with a screening questionnaire for COVID-19-related symptoms. Full personal protective equipment (PPE) was used during the whole study period. No contact was made with the patients following their procedure as per usual practice within the unit.

All procedures were vetted by a PB endoscopist prior to booking onto a therapeutic list based on departmental-agreed ERCP/EUS vetting criteria in line with BSG guidance.<sup>5</sup>

All outpatients underwent telephonic preassessment prior to their endoscopic procedure. Consent forms and patient information leaflets were sent through the post. Preprocedure blood tests were either organised in the community or the outpatient phlebotomy department. All inpatients were reviewed by a gastroenterology registrar or an ERCP consultant. All patients had signed a written consent form prior to their procedure. ERCP and EUS were performed using a standard Olympus TJF 260 V duodenoscope and Olympus UCT 260 linear echoendoscope respectively. All EUS biopsies were performed using 22 G SharkCore needle (Medtronic). Majority of procedures were performed under conscious sedation using fentanyl and midazolam. Some procedures were performed using propofol-administered deep sedation. All staff wore enhanced PPE for all ERCP and EUS procedures during this period as recommended by the BSG.<sup>6</sup> All ERCP patients received 100 mg of rectal diclofenac suppositories in line with

**Table 1** ERCP/EUS procedures and trainee involvement

	Pre-COVID-19 swab (18 March to 17 May 2020)	Post-COVID-19 swab (18 May to 31 July 2020)	Statistical significance (p value)
Inpatient ERCP (78/146, 53.4%)	23	55	0.058
Trainee involvement in ERCP (77/146, 52.7%)	25	52	0.30
Outpatient EUS (75/87, 86.2%)	27	48	0.75
Trainee involvement in EUS (34/87, 39.1%)	14	20	0.50
Preprocedure swab (144/233, 61.8%)	4	140	0.000*

\*"p" value of less than 0.05 was considered as statistically significant.

ERCP, endoscopic retrograde cholangiopancreatography; EUS, endoscopic ultrasound.

the European Society of Gastrointestinal Endoscopy guidelines.<sup>7</sup>

Data were anonymously collected on COVID-19 swab test and COVID-19 antibody test (which was offered to all staff in our organisation) for all endoscopists and nursing staff involved in PB endoscopy in our institution.

## RESULTS

A total of 86 therapeutic procedures were performed between 18 March and 17 May 2020. One hundred and forty-seven procedures were carried out from 18 May to 31 July (see [table 1](#)). Median age of the study population was 71 years. Majority (135/233, 57.9%) were females. KPIs and procedure-related complications for ERCP and EUS procedures are included in [tables 2 and 3](#) respectively. Eighty-seven EUS procedures were performed—62 were diagnostic and 25 underwent EUS-FNA. Two patients with a final diagnosis of cholangiocarcinoma had negative EUS biopsies but were confirmed to have adenocarcinoma on ERCP brush cytology. Trainees were present in total in 47.6% (111/233) of procedures. There were no EUS-related complications or procedure-related 30-day mortality.

Seven of 147 patients had a procedure without a COVID-19 swab during the period when preprocedure swab was established as standard practice (from 18 May 2020). There were no COVID-19-positive

swabs in the 28-day postprocedure period during the entire period of the study.

## DISCUSSION

EUS and ERCP are aerosol-generating procedures and therefore considered high risk for COVID-19 transmission. The ethos of our endoscopy unit during the pandemic was to ensure the utmost safety for patients and staff. At the peak of the COVID-19 pandemic, the BSG issued guidance around use of enhanced PPE for these procedures.<sup>6</sup> The addition of enhanced PPE to the standard led apron meant performing procedures was more challenging for all members of the team. Further, the air flow within the endoscopy rooms was changed to a negative pressure set-up to minimise risk of virus transmission. This markedly reduced the cooling in the procedure rooms resulting in mild dehydration and early fatigue of the team members. There were concerns among the PB endoscopists that this might lead to non-compliance with the national KPIs for these procedures.

Early in the course of the pandemic, the endoscopy team were on a steep learning curve having to deal with new ways of working and communicating using enhanced PPE during the procedures. Following consensus among the PB endoscopists, PB lists were rationalised and capacity was reduced to nine points (each ERCP and EUS procedure was allocated three

**Table 2** KPIs and complications for ERCPs compared against BSG guidelines<sup>13</sup> and 2004 BSG audit<sup>9</sup>

ERCP	North Tees ERCP study (n=146)	BSG audit 2004 (n=5264)	P statistical significance (p value)	BSG-recommended KPIs
Overall CBD cannulation	90.4% (132/146)	86.5% (4554/5264)	0.216	N/A
CBD cannulation in naïve papilla	89.2% (107/120)	83.6% (2684/3210)	0.128	>85%
Stone clearance rate at first ERCP	88.6% (62/70)	62% (1318/2114)	0.000001*	>75%
Biliary stricture decompression	91% (31/34)	73% (1341/1827)	0.017*	>80%
Post-ERCP pancreatitis	4.8% (7/146)	1.5% (79/5264)	0.008*	N/A
Post-ERCP sphincterotomy bleed	0.68% (1/146)	1.5% (33/2260)	0.71	N/A
Post-ERCP cholangitis	0.68% (1/146)	1.1% (59/5264)	1	N/A
ERCP-related mortality	0.68% (1/146)	0.4% (21/5264)	0.45	N/A

\*"p" value of less than 0.05 was considered as statistically significant.

BSG, British Society of Gastroenterology; CBD, common bile duct; ERCP, endoscopic retrograde cholangiopancreatography; KPIs, key performance indicators; N/A, not applicable.

**Table 3** KPIs for EUS compared against JAG standards<sup>14</sup>

EUS	n=87	JAG standards (%)
Completion of procedure	100%	>90
Diagnostic accuracy for EUS-FNA	92% (23/25)	>85

EUS, endoscopic ultrasound; FNA, fine needle aspiration; JAG, Joint Advisory Group; KPIs, key performance indicators.

points) to mitigate issues around preparation for the list (detailed prelist huddle and staff donning and doffing time for PPE) and give adequate intraprocedural time (to deal with these complex procedures and complete an endoscopy report before patients left the room). With experience, the PB lists were rationalised to 12 points from mid-May 2020. The team prehydrated themselves, used lighter lead aprons and chose between respirators and single-use FFP3 masks based on individual preference. The whole intraroom team doffed and donned their PPE as one and took a planned break after two procedures. Other strategies included two PB endoscopists working in tandem and completion of prescription of preprocedure rectal non-steroidal anti-inflammatory drugs and postprocedure fluids prior to commencement of lists. We developed a dedicated ‘runner’ for patient transport between the therapeutic room and the recovery unit. At the end of each endoscopy list, an in-depth team debrief was undertaken to reflect on lessons learnt and discuss ways of improving practice.

This is the first study looking at the impact of COVID-19 on KPIs and procedure-related complications in ERCP and EUS in the literature. A previous study by An *et al*<sup>8</sup> reported a retrospective series of 31 ERCP patients and commented on the safe use of PPE and room preparation for ERCP during the COVID-19 pandemic. However, they did not comment on the KPIs of ERCP and procedure-related complications. Our study confirms that the KPIs and procedure-related complication rates in our hospital during the COVID-19 pandemic are in keeping with published figures in the literature during non-COVID times.<sup>9,10</sup> This will be reassuring for PB endoscopists as the perceived concerns around non-compliance with KPIs due to PPE have not been established in our study. We feel that strict consultant prioritisation of all ERCPs, robust patient work-up prior to listing for procedures, detailed prelist team huddle with rigorous planning for procedures and efficient team working were the key drivers for delivering a safe high-quality service during this pandemic.

A recent study by O’Grady *et al*<sup>11</sup> suggested that the number of ERCPs carried out in their organisation reduced during the COVID-19 pandemic (55 in 2020 compared with 87 in 2019) raising concerns that a significant number of patients with biliary disease remained undetected, untreated and potentially harmed. Our annual ERCP activity is circa 400 procedures; during

the height (4.5 months) of COVID-19 pandemic we undertook 146 ERCP procedures. Thus, there was no reduction in the number of therapeutic ERCPs performed in our hospital compared with the usual non-COVID period. This level of activity was possible by increasing the number of therapeutic lists per week to compensate the number of reduction of procedures per list at the height of the pandemic. Our services continued to be receptive to patient needs and urgent indications for ERCP and EUS procedures.

We also looked at the COVID-19 swabbing practice from 18 May 2020 in our organisation and compared this against the BSG guidance. Seven patients (of which six were outpatients) did not have a swab prior to procedure during this period. These were all within the first 3 days of introduction of routine swabbing practice in our unit. This was felt to be due to incomplete role out of this new practice. All of these patients had a COVID-19 screening questionnaire prior to their procedure and none had a positive swab following their procedure. There were no COVID-19-positive swabs in the 28-day postprocedure period during the entire study period.

One nursing staff member, who regularly assisted in PB endoscopy room, was involved in a non-PB endoscopy procedure on a patient who was COVID-19 positive (not known at the time) and subsequently tested positive for COVID-19. No other nursing staff member assisting PB endoscopy room had a COVID-19 diagnosis (neither tested positive for SARS-CoV-2 PCR antigen test or antibody test). None of the PB endoscopy consultants or trainees developed COVID-19 symptoms or tested positive for SARS-CoV-2 PCR antigen COVID-19 antibody test. This suggests that a combination of a preprocedure-negative COVID-19 swab and wearing enhanced PPE by staff reduces the risk of transmission of COVID-19 during the PB endoscopy procedure.

We also looked at trainee involvement in ERCP and EUS procedures in our unit. There have been significant concerns about endoscopy training during this pandemic. Data from the National Endoscopy Database in the UK showed a 93% reduction in endoscopy training during the COVID-19 pandemic.<sup>4</sup> This could be multifactorial—restructuring of the NHS workforce during the pandemic meant that trainees were redeployed to front-line clinical duties; limited supply of PPE at the beginning of the pandemic; rationalisation of endoscopy lists to essential procedures only; and reduced number of procedures in each list and consultant-delivered therapeutic services (to reduce procedure times and exposure to potential COVID-19) were some of the other factors that were thought to have contributed to the reduction in endoscopy training during the pandemic.<sup>12</sup> In our study, we found that trainees were involved in 47% of the procedures which was far higher than the national figures. In our unit, trainees were allowed to perform the procedure

within an agreed time frame depending on their stage of training. We felt that it was important for the trainees to undergo this experience as the challenges of COVID-19 may occur in some other form in the future.

The main strength of our study is robust data collection. All data were captured after reviewing the electronically accessible patient notes, radiology, pathology and endoscopy reporting systems. To ensure patients who were not admitted to other hospitals after procedure, we used the regional remote access webice systems to access patient information. All patients were followed up for at least 2 months following their procedure which allowed us to capture all procedure-related data including complications.

Our study has some limitations. First, this was a retrospective study. However, data collection was robust and comprehensive. Data were initially collected by ERCP specialist trainees and were crosschecked by an ERCP consultant. Second, this is a single-centre study. However, this study will hopefully act as a baseline for developing ERCP and EUS services during a pandemic by way of a further prospective multicentre study in the future. Finally, we did not contact the patients following their procedure which means we may have missed those who had developed mild symptoms but did not proceed with the COVID-19 swab test.

We conclude that a high-quality PB endoscopy service together with specialist registrar training can be delivered safely and effectively during the COVID-19 pandemic.

**Correction notice** This article has been corrected since it published Online First. The formatting of the title has been corrected.

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**Data availability statement** All data relevant to the study are included in the article or uploaded as supplementary

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