RESEARCH

Day case 'treat and transfer' ERCP service under general anaesthesia

Yasser El-Sherif,^{1,2} John Hunt,¹ Abid Suddle,¹ Brian Prater,³ David Reffitt,¹ John Devlin,¹ Phillip Harrison,¹ Deepak Joshi¹

¹Institute of Liver Studies, King's College Hospital, London, UK

²National Liver Institute, Menoufia University, Shebin El-Kom, Egypt

³Department of Anaesthetics, King's College Hospital, London, UK

Correspondence to

Dr Yasser El-Sherif, Institute of Liver Studies, King's College Hospital NHS Foundation Trust, London SE59RS, UK; y.el-sherif@nhs.net

This abstract has been published in GUT prior to submitting this manuscript.

Received 24 July 2017

Revised 21 January 2018

Accepted 24 February 2018

Published Online First

9 March 2018

ABSTRACT

Objective General anaesthesia (GA) has been increasingly used for advanced endoscopic procedures in particular endoscopic retrograde cholangiopancreatography (ERCP). Given the increasing pressure on many hospitals, the delivery of such service on a regular basis may not always be possible. We established a new day case 'GA ERCP' service. We describe our experience in evaluating the safety and overall feasibility of this new service.

Design Prospective database has been interrogated for the period from March 2015 to December 2016. We documented patients' demographics, ERCP indications, American Society of Anesthesiologists (ASA) status, Cotton grade and complications.

Results 67 patients were referred to endoscopy unit at King's College Hospital (KCH), for urgent day case GA ERCP from nine referring hospitals. The main indications were failed ERCP under sedation 47.8% (32/67), and unavailability of ERCP locally 41.8% (28/67). A total of 64 patients were actually transferred to KCH; 57.8% (37/64) women with a median age 55.8 years (range 23–90). 78.1% (50/64) of patients had a virgin papilla, with 39% (25/64) were ASA ≥ 3 . The Cotton grade was ≥ 3 in 50% (32/64) patients. ERCP was completed successfully in 87.5% (56/64). For patients with previous failed ERCP, repeat ERCP under GA was successful in 75% (24/32). All patients were safely discharged back to their referring hospitals after the short observation period post-ERCP.

Conclusions Urgent inpatient transfers between hospitals for performing ERCP under GA as a day case is safe and feasible. The new GA ERCP pathway can be replicated by other UK centres.

INTRODUCTION

Over the last decade, general anaesthesia (GA) has been increasingly used for advanced endoscopic procedures in particular endoscopic retrograde cholangiopancreatography (ERCP). The

growing utilisation of anaesthesia or deep sedation for ERCP has been driven by a higher degree of complexity, a need to improve procedure efficacy, in addition to improving both patient safety and comfort levels.¹ Conscious sedation has been reported to be insufficient for 14% of patients undergoing an ERCP.² The development of non-invasive diagnostic modalities of biliary imaging has led to the transition of ERCP to an almost exclusively therapeutic procedure in adults. Furthermore, the advent of novel ERCP therapeutic technologies such as cholangioscopy and combined ERCP/Endoscopic Ultrasound (EUS) has led to more complex and longer procedures for patients. ERCP under GA (GA ERCP) is increasingly required for specific subsets of patients. Some patients have comorbidities that mandate GA with tracheal intubation. In addition, a recent study demonstrated that a considerable number of patients personally request GA for their procedure.³

In 2011, the British Society of Gastroenterology (BSG) released guidance for the use of propofol sedation for ERCP procedures, recommending that hospitals should have dedicated sessions for the delivery of such sedation and that it should only be delivered by an anaesthetist with appropriate support.⁴ Minimum requirements for equipment, environment and staffing were also specified. Thus, close collaboration between endoscopy units and anaesthesia departments is essential to the provision of such a service. The demand for GA ERCP is likely to increase in the future to facilitate both patients and clinicians requests.³ The routine availability of GA ERCP is becoming more of a necessity in the provision of an ERCP service. Given the increasing pressure on many hospitals, the delivery of such service on a regular basis may not always be possible.

To cite: El-Sherif Y, Hunt J, Suddle A, et al. *Frontline Gastroenterology* 2018;**9**:317–322.

The low number of patients likely to require a GA ERCP in each individual hospital makes it difficult to establish regular GA ERCP lists. There is therefore, a growing need for a flexible service that is safe, readily available and cost efficient.

At King's College Hospital (KCH) NHS Foundation Trust, London, in March 2015, we established a new day case 'treat and transfer GA ERCP' service. The service allows local hospitals to transfer inpatients requiring urgent GA ERCP to KCH endoscopy unit for a day case GA ERCP procedure. Patients are discharged back to their referring hospitals after 4-hour observation period post completion of ERCP. The key driver was to make GA ERCP available for all inpatients within our local network.

In this study, we describe our experience in evaluating the safety and overall feasibility of this new service. We outline patients' demographics, indications, complications and the possible overall impact of the service on our network.

METHODS

This is a descriptive study of a cohort of patients who attended for GA ERCP during the time period from March 2015 to July 2016. All adult inpatients that were referred to KCH endoscopy unit for the purpose of undergoing urgent GA ERCP were included. Data were collected for each day case procedure using the Electronic Patient Record and Endosoft GI Endoscopy reporting tool. Individual patients' medical notes were also reviewed when necessary. Data recorded included patients' demographic details, indications for ERCP, American Society of Anesthesiologists (ASA) status and Cotton grade of endoscopic difficulty.

Pre-ERCP assessment

Referrals for GA ERCP were made on a specified endoscopy request form and sent to the ERCP coordinator in our endoscopy unit (figure 1). The referral form included a full clinical and biochemical profile for each patient. Patient investigations and images were uploaded to our radiology imaging system as necessary. All referrals were reviewed by a consultant ERCPist on the same day they were received. Full anaesthetic

assessment was undertaken at the referring hospital. The assessment report was reviewed by a consultant anaesthetist at KCH prior to patient transfer. Another anaesthesia assessment was performed for each patient by our anaesthesia team immediately prior to the procedure in the endoscopy unit. All transferred patients were accompanied by a trained nurse escort and had a copy of their notes including previous ERCP reports and last blood tests.

ERCP provision at KCH

All ERCP lists at KCH, Denmark Hill are performed under GA within the endoscopy department. There are seven ERCP lists per week including one dedicated paediatric ERCP list. GA was delivered by a dedicated group of consultant anaesthetists who rotate regularly through the endoscopy department. All consultant anaesthetists were experienced in GA for endoscopic procedures and had the support of an operating department assistant (ODP). All patients were intubated and had electrocardiographic, pulse oximetry, non-invasive blood pressure and end-tidal CO₂ monitoring during the procedure. Propofol 10 mg/mL (1%) was administered in doses of 1.5–2.5 mg/kg for anaesthesia induction. This was followed by maintenance with a volatile anaesthetic agent via the endotracheal tube. The administration of fentanyl (or alfentanil) and midazolam were variable and used according to the anaesthetist assessment. All patients are consented for the use of per rectum non-steroidal anti-inflammatory drugs. Antibiotics were administered on an individual, case by case basis.

All ERCP procedures were consultant delivered under GA with intubation. We used TJFV or JFV video duodenoscope (Olympus; UK). All ERCP procedures were performed with patients in the supine position.

Post-ERCP care

Following ERCP, all patients are closely monitored cardiovascularly (heart rate, blood pressure and temperature) in the endoscopy unit recovery area for 4 hours. At the end of the observation period, each patient was clinically reviewed by the endoscopist and nurse before discharge back to their local hospital. A

Figure 1 Pre-ERCP assessment pathway. ERCP, endoscopic retrograde cholangiopancreatography; GA, general anaesthesia; KCH, King's College Hospital.

Table 1 Total patients's referrals by geographical distribution

Hospital	No of patients
Bromley, London	25
Gillingham, Kent	14
Ashford, Kent	16
Dartford, Kent	5
Central London	3
Greenwich, London	3
Central London	3
East Sussex	1
Total	67

prolonged hospital stay was defined as any patient who required observation for >4 hours prior to discharge. Patients who were not safe to transfer back to their referring hospital would be admitted if required.

RESULTS

During the study period, 67 patients were referred to endoscopy unit at KCH for GA ERCP. This accounts for all ERCP day cases referred to KCH during that period. All patients were classified as needing urgent inpatient day case transfers, from any of the nine different referring hospitals in our local network (table 1).

Indications for ERCP under GA

The main indications for ERCP under GA were failed ERCP under conscious sedation 47.8% (32/67), and unavailable ERCP list locally 41.8% (28/67). Other indications included patient's request, unsafe for sedation, liver transplant and pancreatic duct stones (table 2).

Three patients were cancelled by their local hospitals for the following reasons: one patient deteriorated clinically and was too unstable for transfer, another patient was deemed not fit for GA, and the third patient

Table 2 Indications for GA-assisted endoscopy

Indication of GA	No of patients
Failed ERCP	
Intolerant of conscious sedation	14
Failed deep cannulation/ERCP	15
Failed intubation*	3
No access to ERCP list locally	28
Patient's request	2
Unsafe for sedation	2
LTx patient	2
Pancreatic duct stone†	1
Total	67

*Two patients had oesophageal stricture, one patient large hiatus hernia.

†LTx, patient with transplanted liver.

ERCP, endoscopic retrograde cholangiopancreatography; GA, general anaesthesia.

Table 3 General features of ERCP patients

Age, years	23–90
Gender	M: 27 (Pt) F: 37
Virgin papillae	Yes: 50 No: 14
ASA status*	1: 11 2: 28 3: 19 4: 6
Cotton grade	3–4: 32

*In total, 54 patient underwent GA ERCP at KCH.

ASA, American Association of Anaesthesiologist; ERCP, endoscopic retrograde cholangiopancreatography; GA, general anaesthesia; KCH, King's College Hospital.

required full inpatient transfer to KCH liver ITU due to progressive deterioration of the underlying cholangiocarcinoma. The last patient received a successful ERCP and biliary stent as an inpatient at KCH. After exclusion of cancelled referrals, a total of 64 patients with ERCPs were transferred to KCH endoscopy unit. The median age was 55.8 years (range 23–90) and 57.8% (37/64) of patients were women. The majority of patients had virgin papilla 78.1% (50/64), with relatively high ASA and Cotton grade of 3 or 4; 39% (25/64) and 50% (32/64) respectively (table 3).

All patients had ERCP within 48–72 hours of receipt of request form. ERCP was performed on all patients transferred and completed successfully in 87.5% (56/64) patients. ERCP was successfully completed in 75% (24/32) patients who were transferred due to a prior failed ERCP in their local hospital. ERCP was not completed in eight (25%) patients who previously had failed ERCP. Causes of ERCP failure included anatomical distortion 63% (five out of eight) (ampulla could not be accessed or visualised) and failed cannulation in 37% (three out of eight) of patients (one patient had oedematous ampulla, with failed deep cannulation of two patients) (table 4).

Complications

No complications, anaesthesia or endoscopy related, were reported during the procedure or during the 4-hour post procedure recovery period. Three patients

Table 4 Causes of failed GA-assisted ERCP

Cause of failed ERCP	No of patients
Anatomical distortion	
Duodenal distortion	1
Duodenal diverticulum	2
Failed intubation/oesophageal stricture	2
Failed cannulation	3
Total	8

ERCP, endoscopic retrograde cholangiopancreatography; GA, general anaesthesia.

required overnight admission; however, two of them were planned admissions (one patient transferred his private healthcare to KCH on his request, while the other patient was admitted for social reasons). The third patient was electively admitted to HDU due to concerns that he might require respiratory support as he was NIV dependent. There was no capacity for this to be arranged post-ERCP locally on the day. In HDU, he required no respiratory or cardiovascular support and remained haemodynamically stable throughout the night. He was discharged back to his referring hospital the following morning.

DISCUSSION

The endoscopy department at KCH is a secondary and tertiary referral centre for pancreaticobiliary endoscopy. In 2005, KCH adopted the approach of performing all ERCPs under GA to improve the safety and efficacy of the ERCP service and also improve the patient experience. In our experience, GA has enhanced patients' safety and improved overall ERCP success rates. It also allowed sufficient time for ERCP training of fellows and nurses. Six adult and one paediatric GA ERCP lists are performed each week, three ERCP cases per every list. This is still a cost efficient number as there is no incomplete or repeated procedure secondary to sedation-related failure.

In March 2015, the endoscopy unit at KCH expanded its service to assist local hospitals by forming a new local network pathway and establishing a day case 'treat and transfer GA ERCP' service. This allows hospitals in the network to transfer their inpatients to KCH endoscopy unit for the purpose of receiving ERCP under GA, and enables transfer back to the referring hospital later that day. High-quality specialist care is provided by a specially trained team of nurses, anaesthetists and endoscopists in our endoscopy unit. This study was performed to assess the feasibility of day case inpatient transfer of patients to facilitate urgent GA ERCP procedures.

During the study period, 64 patients were transferred to our unit to receive GA ERCP under the new service network programme. As expected, a large number of patients had higher ASA status and Cotton grade of 3 and 4 (39% and 50%, respectively), reflecting an above average complexity level according to Quality Committee of the American Society of Gastrointestinal Endoscopy.⁵ ERCP was successfully completed in the vast majority of patients (87.5%). Thirty-two patients were referred due to failed ERCP at their local hospital. Of these, ERCP was successfully completed under GA in 24 patients (75%). These findings are in agreement with a previous study that showed higher ERCP failure rates when conscious sedation was used compared with GA, due to the premature termination of ERCP secondary to inadequate sedation.²

In our study, no significant complications were recorded during the procedure or in the 4-hour

postprocedure recovery period. Only one unplanned admission following GA ERCP was necessary, and this was for a precautionary reason. This patient was discharged uneventfully the following morning.

Although this is not a comparative study, these results clearly reveal a better short-term safety profile than that of conscious sedation. Conscious sedation has been reported to be inadequate for up to 14% of patients undergoing ERCP.² Furthermore, up to half of patients undergoing ERCP under conscious sedation experience pain and discomfort during the procedure and postprocedural period.⁶ Data from Cochrane review showed a better recovery profile among patients receiving propofol, with a comparable safety profile with that of conscious sedation using midazolam and opioid.⁷ The safety of conscious sedation is an additional issue. In 2004, the British Society of Gastroenterology published the UK ERCP audit that showed that 33% of patients with conscious sedation received a high midazolam dose of >5.5 mg. About 8% of patients required the administration of reversal agents (flumazenil or naloxone).⁸

In this study, it worth highlighting that all ERCPs were conducted within the endoscopy department under GA with patients in the supine position. Consultant anaesthetists are regularly rostered through ERCP lists in our unit. This is an essential requirement for the service success. Providing anaesthesia outside the operation room can be challenging for anaesthetists. One study showed higher complications and even death rates compared with anaesthesia administered in the operating room.⁹ Anaesthetists who rotate regularly within an endoscopy unit had lower procedure times and complication rates when compared with anaesthetists who used anaesthesia infrequently or on an 'ad hoc' basis for ERCP.¹⁰ A dedicated anaesthesia team with regular rotation within the endoscopy unit is pivotal.¹¹

Propofol sedation is generally safe and may be seen as preferable to general anaesthesia as the turnover between cases is quicker. The practice, however, varies among anaesthetists at different centres due to the lack of data to support one approach over the other. While some anaesthetists use propofol as default, others consistently intubate every patient. The latter may be influenced by the increased complications and risk of death of anaesthesia used outside the operation room.⁹ Our anaesthesia team has opted to use GA in all ERCP procedures to minimise risk and enhance outcome, however different approach can be adopted according local anaesthetists' comfort and experience.

One possible limitation of this new pathway is that our anaesthetists were not able to physically review the patient until immediately prior to the procedure. The BSG and Royal College of Anaesthetists (RCoA) guidelines for the use of propofol sedation in 2011 suggested that while anaesthetists may not need to review all the patients personally, they should ensure

that an adequate preassessment procedure is followed for all potential patients.⁴ Our pathway included an anaesthetic review to be performed by a local anaesthetist and forwarded to us prior to patient transfer. Moreover, all patients received another anaesthetic review in our endoscopy unit on the day of their procedure.

The limitations of our study include an absence of randomisation of patients, and the lack of a control group whose ERCP was performed under conscious sedation. However, the aim of the study was to assess the feasibility of the service itself, and not the procedure-related complications as a comparator of other sedation techniques. In addition, we were not expecting to find significant differences in complications or mortality as compared with ERCP under conscious sedation. A Cochrane review identified no difference in the mortality or serious cardiorespiratory complications between propofol and conscious sedation techniques, however there was a better recovery profile among patients receiving propofol.⁷

The financial impact of this service is clearly an important issue. Optimising medical resources for ERCP procedures without risking the patient's safety or compromising the quality of the service is an indispensable requirement. The current study did not formally assess the financial aspects of the service. Nevertheless, we believe that this service is cost-efficient especially for low volume ERCP endoscopy units. The availability of GA ERCP or propofol lists needs to be addressed by units and networks providing ERCP.⁴ Booking an anaesthetist, anaesthesia nurse assistant and/or ODP for a half day may not be cost-efficient when there are less than three cases on a GA ERCP list. The low frequency of cases that require GA ERCP makes a once weekly GA list non feasible. A monthly GA ERCP list may be more realistic choice to meet hospital requirements, yet this can result in a considerable delay for inpatients to undergo procedures, leading to possible complications, an inevitable longer hospital stay and an overall increasing cost. Ad hoc lists may be even worse for the same reasons, in addition to the notable lack of a regularly rostered experienced anaesthetist. Bearing in mind the current need to optimise medical resources without affecting patients' safety, it seems that our new pathway service would be an attractive and safe alternative and should become part of a hospitals' routine.

In conclusion, urgent inpatient transfer of patients between hospitals for the purpose of performing GA ERCP as a day case is safe and feasible from an endoscopic and anaesthetic perspective. Meticulous anaesthetic assessment pre-procedure and transfer is quintessential to ensure that patient safety is maintained. It offers patients the best chance of undergoing a successful ERCP, and it reduces delays for inpatients in the network who require urgent intervention. Patients presenting with acute conditions requiring

Significance of this study

What is already known in this topic

- ▶ General anaesthesia (GA) and/or propofol sedation has been increasingly required for complex endoscopy procedure especially endoscopic retrograde cholangiopancreatography (ERCP).
- ▶ The availability of ERCP under GA is even more crucial for a specific subset group of patients for example, significant comorbidities and intolerance to conscious sedation.
- ▶ Given the increasing pressure on many hospitals, the delivery of such service on a regular basis may not always be possible.

What this study adds

- ▶ We established a new local pathway that allows local hospitals to transfer inpatients requiring urgent ERCP under GA to our endoscopy unit as day case procedure.
- ▶ Patients are discharged back to their referring hospitals on the same day after the procedure following a short observation period.
- ▶ We performed this study to evaluate the safety and feasibility of this new service.

How might it impact on clinical practice in the foreseeable future

- ▶ If this service is successful locally, it can be replicated to many other National Health Service localities.
- ▶ This service can play a major role to improve health service for inpatients requiring urgent ERCP under GA.

urgent inpatient GA ERCP can be efficiently and effectively treated as day cases using this pathway. The GA ERCP pathway adopted by our institution has been successful locally and can be replicated by other UK centres within their ERCP network.

Acknowledgements The authors would like to thank the endoscopy, administrative and secretarial workers at all hospital sites who assisted in facilitating the service and data collection for the study.

Contributors YES and DJ assisted with the acquisition, analysis and interpretation of the data; wrote, edited and revised the article. JH, AS, BP, DR, JD and PH helped edit and revise the article.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Provenance and peer review Not commissioned; externally peer reviewed.

© Article author(s) (or their employer(s) unless otherwise stated in the text of the article) 2018. All rights reserved. No commercial use is permitted unless otherwise expressly granted.

REFERENCES

- 1 Inadomi JM, Gunnarsson CL, Rizzo JA, *et al.* Projected increased growth rate of anesthesia professional-delivered

- sedation for colonoscopy and EGD in the United States: 2009 to 2015. *Gastrointest Endosc* 2010;72:580–6.
- 2 Raymonds K, Panning B, Bachem I, *et al.* Evaluation of endoscopic retrograde cholangiopancreatography under conscious sedation and general anesthesia. *Endoscopy* 2002;34:721–6.
- 3 Joshi D, Paranandi B, El Sayed G, *et al.* Experience of propofol sedation in a UK ERCP practice: lessons for service provision. *Frontline Gastroenterol* 2015;6:32–7.
- 4 On behalf of the Joint Royal College of Anaesthetists (RCoA) and British Society of Gastroenterology (BSG) Working Party. Guidance for the use of propofol sedation for adult patients undergoing endoscopic retrograde cholangiopancreatography (ERCP) and other complex upper GI endoscopic procedures. 2011.
- 5 Cotton PB, Eisen G, Romagnuolo J, *et al.* Grading the complexity of endoscopic procedures: results of an ASGE working party. *Gastrointest Endosc* 2011;73:868–74.
- 6 Jeurnink SM, Steyerberg E, Kuipers E, *et al.* The burden of endoscopic retrograde cholangiopancreatography (ERCP) performed with the patient under conscious sedation. *Surg Endosc* 2012;26:2213–9.
- 7 Garewal D, Powell S, Milan SJ, *et al.* Sedative techniques for endoscopic retrograde cholangiopancreatography. *Cochrane Database Syst Rev* 2012:CD007274.
- 8 Williams EJ, Taylor S, Fairclough R, *et al.* Are we meeting the standards set for endoscopy? Results of a large-scale prospective survey of endoscopic retrograde cholangiopancreatograph practice. *Gut* 2007;56:821–9.
- 9 Cook T, Behringer EC, Benger J. Airway management outside the operating room: hazardous and incompletely studied. *Curr Opin Anaesthesiol* 2012;25:461–9.
- 10 Goudra BG, Singh PM, Sinha AC. Anesthesia for ERCP: impact of anesthesiologist's experience on outcome and cost. *Anesthesiol Res Pract* 2013;2013:1–5.
- 11 Thosani N, Banerjee S. Deep sedation or general anesthesia for ERCP? *Dig Dis Sci* 2013;58:3061–3.