

# To Identify the Adverse Outcome Arisen Due to Delay in Definite Investigation and Treatment of Patients Admitted with Obstructive Jaundice; An Audit at Royal Preston Hospital, United Kingdom

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**Abstract**— Obstructive jaundice is the type of jaundice occurred due to a blockage in the bile flow from the liver to the intestine, resulting in redirection of excess bile and its by-products such as bilirubin into the systemic blood stream. For a considerable time, Endoscopic Retrograde Cholangio-Pancreatography (ERCP) was considered as the diagnostic and therapeutic procedure of choice but after advent of Magnetic Resonance Cholangio-Pancreatography (MRCP), the role of ERCP has changed to predominantly therapeutic purpose. Other Imaging modalities include – Computerized Tomography (CT)scan, Ultrasound Sonographic Scan (USG), Endoscopic Ultra Sound Scan (EUS) and Hepatobiliary-Imino-DiaceticAcid (HIDA) scan.

This audit was carried out to find out the delay in investigation between MRCP, USG and CT scan and the treatment. Patients admitted with obstructive Jaundice over the age of 16years were included. Retrospective data collection was done from 1st of January to 30th of June 2022 at Lancashire Teaching Hospital NHS Foundation Trust, United Kingdom. 20 Patients were gathered using comprehensive Integrated Health Management System - quart med (Qmed).

Results showed that 80% of the investigation was done by MRCP, 15% was by CT scan and 5% was by USG. The mean delay in getting the MRCP done was 4.19 days and among them 6.38 days of delay was seen in getting the right treatment. CT scan faced a delay of 1.67 days as a diagnostic investigation and a delay of 7.2 days was seen in getting the definitive treatment. No one faced any delay with USG as the diagnostic investigation, and mean delay of 16 days was found in getting treatment.

Recommendations were given; to modify the schedules of MRCP and ERCP to improve outcomes; to identify obstructive jaundice at an early stage followed by early USG scans to start the investigation process in the presence of delaying in MRCP; to start prophylactic antibiotics for biliary sepsis when obstructive jaundice is identified; and to anticipate the need for ERCP and generate provisional lists.

Further, to study the reasons in delay in ERCP; to compare administrative reasons in delay in imaging; to compare delay in MRCP with the findings of comparable hospitals; to explore the opportunity of using prophylactic antibiotics in patients with obstructive jaundice; and to re-audit with a bigger sample size; were identified as prospects for future audits.

## I. INTRODUCTION

Obstructive jaundice is the type of jaundice occurred due to a blockage in the bile flow from the liver to the intestine, resulting in redirection of excess bile and its by-products such as bilirubin into the systemic blood stream.

Biochemical markers indicating an obstructive picture include, rise in liver enzymes - Alkaline Phosphatase (ALP) and Gama Glutamyl Transferase (GGT) and this condition could result in several complications such as ascending cholangitis, hepatorenal syndrome, and malabsorption.

Cholelithiasis or formation of biliary calculi is a common cause of abdominal pain which is commoner in fertile, fat, females in their forties. 80 % gall bladder calculi are composed of more than 50 % cholesterol and are seen mainly among patients with obesity, diabetes, and those who are undergoing rapid weight loss.

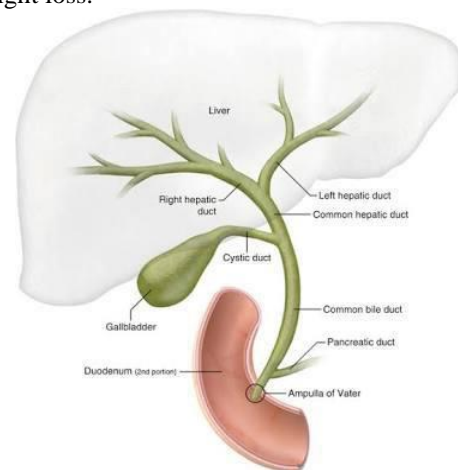


Fig. 1: Anatomy of the biliary system.

Remaining 20 % of calculi are made of bile pigments and mainly seen in patients of haemolytic anaemia. Even a small calculus can cause biliary obstruction in its easy passage into the bile duct. Biliary obstruction can also be caused by a calculus that has impacted in the region of the neck of the gall bladder causing extrinsic compression of bile duct with resultant obstructive jaundice, this being known as Mirizzi's syndrome.

The role of imaging is crucial in diagnosing the site and the cause of obstruction and its nature as benign or malignant. Conventionally, to find the cause of obstruction, an ultrasound is deemed as the first imaging modality of choice compared to Magnetic resonance cholangio pancreatography (MRCP),

predominantly because the former is cheap and widely accessible and available. For a considerable time Endoscopic retrograde cholangio pancreatography (ERCP) was considered as the diagnostic and therapeutic procedure of choice but after advent of MRCP, the role of ERCP has changed to predominantly therapeutic and other imaging modalities are computerized tomography (CT) scan, ultra sound sonographic scan (USG), endoscopic ultra sound scan (EUS) and hepatobiliary iminodiacetic acid (HIDA) scan.

*MRCP for Obstructive Jaundice:*

MRCP provides a detailed look into the biliary tree and has high diagnostic accuracy. Contrast and non-contrast based in newer machines show biliary excretion highlighting the biliary tree.

Non-contrast MRCP technique is based on heavily T2 weighted sequence which can be performed in two-dimensional (2D) or three-dimensional (3D) modes. It shows increased signal from bile and pancreatic duct fluid and suppresses signal from background tissues. Contrast-enhanced MRCP is based on the principle of selective excretion of liver specific, gadolinium and magnesium-based MR contrast media by the liver into the biliary system, in 10–60 min and is the main indication of biliary leak. MRCP provides a diagnostic accuracy of 97.2% in detecting the obstructive jaundice.

*CT for Obstructive Jaundice:*

CT scanning brings out details about the structure of the obstacle giving an etiological diagnosis. It ensures accurate detection of dilated intra and extra hepatic bile ducts when the study is performed with intravenous contrast.

*Ultrasound for Obstructive Jaundice:*

Average sensitivity of Ultrasound scanning is 73% at diagnosing patients with choledocholithiasis. It is though good at detecting dilated bile duct with a sensitivity of 87%, it can be misleading if there is sludge in the biliary duct which can be echogenic, in obese patients, and in patients with “Pneumobilia” or gut gas shadows. It will be a good initial investigation but not the investigation of choice.

*Justification*

After the confirmation of obstructive jaundice, an ERCP is usually the next plan of action to relieve the cause of obstruction. However, at Royal Preston Hospital, patients coming in with obstructive jaundice end up waiting for longer than is anticipated for MRCP and that leads to unwanted prolongation in the clinical course of management. Delay in MRCP results in a delay in ERCP or further investigations/treatment thence increasing the chances of complications like biliary sepsis etc.

At Royal Preston Hospital (RPH) / Chorley District Hospital (CDH), once a request for an “In Patient MRCP” is booked, the patient is given a time slot in the MRI suite along with other patients who are waiting for MRI for other reasons with escalation on need basis. There are no designated days for MRCP at the trust whereas Tuesdays and Thursdays are designated for ERCP. This means that if a patient coming in on Wednesday does not have his MRCP done that day, he will not

have his ERCP the next day i.e. Thursday and will thus be left to wait till next week for treatment. This potentially increases the risk of patients developing complications mentioned before.

II. OBJECTIVES

1. To learn what proportion of patients admitted with obstructive jaundice had MRCP / USG / CT scan.
2. To analyse the time of admission and how long did it take before they had the planned investigation done.
3. To find out the patients had faced delay in definitive investigation and treatment along with developed any complications as a consequence.
4. To compare delay in carrying out of investigation between MRCP, USG and CT scan.

III. METHODOLOGY

It was a retrospective, analytic study. Data collection was done from 1<sup>st</sup> of January to 30<sup>th</sup> of June 2022 at Lancashire Teaching Hospital NHS Foundation Trust, UK by using comprehensive Integrated Health Management System - quart med (Qmed). 20 patients were enrolled in the study. Data were entered and analysed using SPSS v 21.

We studied the data of 20 patients and labelled the day when they first had a rise in ALP / GGT as Day 0. Days were counted such as when patients had the definitive investigation done, when they had their definitive treatment for the obstructive jaundice, what the delay between the investigations being requested and them being carried out, and finally what complications were developed as a result of the delay.

All the patients aged more than 16 years of age, admitted with obstructive Jaundice were included and patients aged less than 16 years of age and patients admitted with jaundice that was not due to obstructive cause.

IV. RESULTS

TABLE 1: Distribution of investigations for obstructive jaundice (n=20)

	Name of the investigation	Frequency	Percentage (%)
1.	MRCP	16	80
2.	USG	1	5
3.	CT Scan	3	15
	Total	20	100

Table shows that 80% of investigations for obstructive jaundice were MRCP while 15% and 5% were CT scan and USG respectively.

TABLE 2: Distribution of days of delay for MRCP (n=16)

	Days	Frequency	Percentage (%)
1.	Delay	11	68.8
2.	No delay	5	31.2
	Total	16	100

During the MRCP, 5patients (31.2%) experienced no delay in the investigation for obstructive jaundice. However, 68.8% patients faced delay in having their MRCP done.

Of the 68.8% patients who faced delay in having their MRCP done, 54.5% went on to develop complications while 45.5% did not.

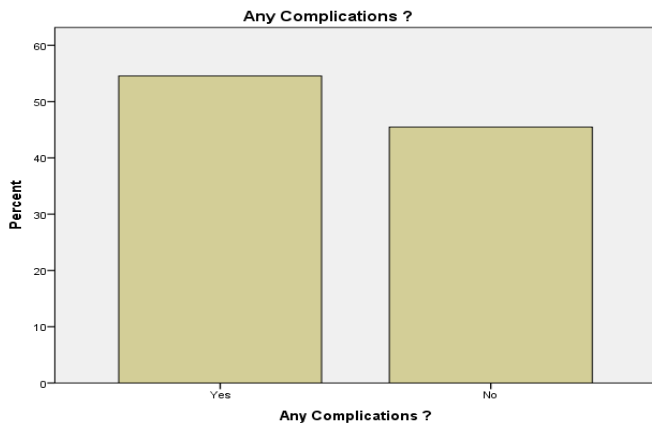


Fig. 2: Frequency of complications of delayed MRCP (n= 11)

TABLE 3: Summary of MRCP investigation on obstructive jaundice

Investigation	Delayed MRCP – 68.8%				Not delayed MRCP – 31.2%				MRCP Mean delay
	Delayed		Not delayed		Delayed		Not delayed		
Treatment in days	72.7%	11 days	27.3%	-	40%	6 days	60%	-	6.38 days

Of the 31.2% who faced no delay in getting the MRCP done, 60% faced no delay in getting the definitive treatment (Rx) done; whereas the 40% who did face delay in getting the definitive Rx faced a mean delay of 6 days. Of the 68.8% who faced delay in getting the MRCP done 27.2% had no delay in getting the definitive Rx; whereas 72, 7% did. Those who did face delay in treatment faced a mean delay of 11 days.

As a whole; all patients who had MRCP faced a mean delay of 6.38 days in getting the right treatment.

TABLE 4: Summary of CT scan investigation on obstructive jaundice

Investigation	Delayed CT scan – 33.3%				Not delayed CT scan – 66.7%			
	Delayed		Not delayed		Delayed		Not delayed	
Treatment in days	33.3%	3days	-	-	66.7%	9.2days	-	-

All 33.3% who faced delay in getting the CT scan done faced a delay of 3 days in getting the definitive treatment.

All 66.7% who did not face any delay in getting the CT scan done, had a mean delay of 9.2 days in getting the definitive treatment done.

TABLE 5: Summary of USG investigation on obstructive jaundice

Investigation	Delayed USG – 0%				Not delayed USG – 100%			
	Delayed		Not delayed		Delayed		Not delayed	
Treatment in days	-	-	-	-	100%	16 days	-	-

5% patients who had USG as the diagnostic investigation, no one faced any delays and test was done either the same day or the following day. However, all got delay in definitive treatment being offered due to complications following USG and delay was 16 days in getting treatment.

Investigation delays were highest with MRCP (4.19 days). Treatment delays were highest following USG which is 16 days

and considerably higher than other two investigation modalities. Approximately half of the patients who faced with MRCP developed complications while complications developed following USG was the least (0%).

TABLE 6: Complications due to MRCP, CT scan and USG

		MRCP	CT scan	USG
1.	Investigation- delay in days	4.19	3.0	0
2.	Treatment- delay in days	6.38	7.2	16.0
3.	Complications- in %	54.5%	33.3%	0%

V. DISCUSSION

Amongst patients who had MRCP as their definitive investigation, 31.2% patients had no delay in getting the MRCP done which means that they had it on either Day 0 or day 1.68. 8% faced delays in getting the MRCP done. Such delays in carrying out MRCP could be due to clinical pressure, pressure of scanning sick patients first, patients becoming unwell prior to scan, and limited scanner due to increasing number of COVID patients. Delay in carrying out MRCP which was 4.19 days is higher than that of CT scan and USG scan which were only 1.67 days and one day respectively.

54.5% who got MRCP scan done went on to develop complications. A potential reason for these complications could be delays in getting the definitive treatment and not just delay in MRCP alone. Patients developed the highest number of complications with MRCP. CT scan gave less complication than MRCP but more than USG while USG led to the least number of complications. For USG 100% morbidity was due to delay in treatment.

VI. RECOMMENDATIONS

1. Radiology / MRI team to designate fixed days for carrying out MRCP – preferably Monday and Wednesday as Tuesday and Thursday are specified for ERCP. This means that patients who have an MRCP can have an ERCP the next day potentially reducing overall morbidity and potential mortality.
2. Obstructive jaundice to be identified at an early stage and USG can be requested at an early stage to start the investigation process if there is a delay in MRCP being carried out.
3. Consider starting prophylactic antibiotics for biliary sepsis when obstructive jaundice is identified instead of waiting for sepsis to be developed; in order to reduce morbidity from Biliary sepsis.
4. Anticipate the need for ERCP and generate provisional lists of patients who are awaiting imaging and could potentially need ERCP

VII. LIMITATIONS

- Low number of patients

VIII. PROSPECTS FOR FUTURE AUDITS

1. Compare and contrast administrative reasons in delay in imaging
2. Re-audit with a bigger sample size

3. To compare delay in MRCP in Chorley vs Royal Preston Hospital
4. Study the reasons in delay in ERCP being carried out
5. Study and compare the prospects of using prophylactic antibiotics in patients with obstructive jaundice

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