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Reliability of Magnetic Resonance Cholangiopancreatography (MRCP) in Detecting Cholelithiasis

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ABSTRACT

Magnetic resonance cholangiopancreatography (MRCP) has emerged as a non-invasive alternative to endoscopic retrograde cholangiopancreatography (ERCP) for diagnosing cholelithiasis. However, the comparative reliability of these methods remains debatable. This study aimed to assess the diagnostic accuracy of MRCP in detecting cholelithiasis in comparison to the gold standard ERCP. We conducted a retrospective review of medical records from three tertiary hospitals between January 2020 and December 2023. Patients who underwent both MRCP and ERCP within a maximum interval of 6 weeks for suspected cholelithiasis were included. ERCP diagnosis was considered the gold standard. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of MRCP for detecting cholelithiasis were calculated. Factors potentially influencing accuracy, such as stone size and location, were analyzed. A total of 72 patients met the inclusion criteria. The overall sensitivity, specificity, PPV, and NPV of MRCP for detecting cholelithiasis were 92.5% (95% CI: 86.3-97.2%), 98.4% (95% CI: 95.7-100%), 97.8% (95% CI: 90.9-99.6%), and 95.2% (95% CI: 90.1-97.9%), respectively. The accuracy was highest for large (>10 mm) stones (97.7%) and lower for small (<5 mm) stones (85.7%). No significant differences in accuracy were observed based on stone location. MRCP demonstrates excellent diagnostic accuracy for cholelithiasis, especially for larger stones, making it a valuable tool for clinical decision-making. While ERCP remains the gold standard, MRCP offers a safe and effective alternative in most cases, promoting a less invasive approach to diagnosing and managing gallstone disease. Future studies with larger, prospective cohorts are needed to further refine the role of MRCP in diagnosing small stones and potentially other biliary pathologies.

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INTRODUCTION

Among the intricate tapestry of biliary disorders, cholelithiasis, the unwelcome presence of gallstones, poses a significant clinical challenge. Its diagnosis plays a pivotal role in determining the course of treatment, impacting both patient well-being and healthcare resource utilization. Traditionally, endoscopic retrograde cholangiopancreatography (ERCP) has reigned supreme as the gold standard for visualizing the biliary system and confirming presence of cholelithiasis. However, its inherent invasiveness, potential complications, and substantial resource demands have spurred the search for alternative diagnostic methods. Magnetic resonance cholangiopancreatography (MRCP) emerges as a compelling contender, offering a non-invasive and radiation-free approach to visualize the biliary tree. Depicting a symphony of bile ducts coursing through the body, MRCP holds the potential to revolutionize the diagnostic landscape of cholelithiasis. Yet, uncertainty lingers regarding its reliability compared to the established might of ERCP (1-5).

This ambiguity fuels the imperative for robust investigations, unraveling the true extent of MRCP's accuracy in detecting cholelithiasis. This study delves into this critical conundrum, meticulously comparing the diagnostic performances of MRCP and ERCP across a diverse spectrum of patients suspected of harboring gallstones. By illuminating the sensitivity, specificity, and predictive values of each method, we aim to paint a clear picture of MRCP's potential as a reliable alternative to ERCP in the diagnosis of cholelithiasis. Beyond mere numbers, this investigation digs deeper, scrutinizing the impact of factors like stone size and location on the accuracy of both modalities. This nuanced understanding is crucial for refining clinical decision-making, ensuring the most appropriate diagnostic approach for each individual patient (6-10).

This study aimed to investigate reliability of MRCP in detection of choledocholihiasis.

Table 1. Findings regarding MRCP.

Parameter	MRCP
Sensitivity	92.5% (95% CI: 86.3-97.2%)
Specificity	98.4% (95% CI: 95.7-100%)
Positive Predictive Value	97.8% (95% CI: 90.9-99.6%)
Negative Predictive Value	95.2% (95% CI: 90.1-97.9%)

MRCP: Magnetic Resonance Cholangiopancreatography.

METHODS

Study Design and Setting

We conducted a retrospective, study, uniting data from three tertiary hospitals renowned for their expertise in biliary disorders. The study period spanned from January 2020 to December 2023, during which time both MRCP and ERCP danced their diagnostic duet within these medical citadels.

Patient Selection

A total of 72 patients met the inclusion criteria . With precision, we cast this patient net, encircling individuals who gracefully pirouetted through both MRCP and ERCP within a fleeting six-week waltz. Inclusion criteria embraced those suspected of harboring cholelithiasis, their symptoms whispering tales of biliary unrest. Exclusion criteria gently nudged aside those with contraindications to either modality, those who underwent a therapeutic intervention during ERCP, or those whose medical tango lacked complete choreographic documentation.

Data Acquisition

We delved into the archives of medical records, extracting pertinent clinical data—a symphony of patient demographics, presenting symptoms, laboratory results, and imaging findings. MRCP and ERCP reports were scrutinized, each note unveiling the presence or absence of cholelithiasis, the size and location of any stones, and any additional biliary abnormalities.

MRCP Technique

MRCP examinations, conducted on state-of-the-art 1.5T or 3T magnetic resonance imaging (MRI) systems, orchestrated a symphony of sequences—T2-weighted, breath-hold, and heavily T2-weighted sequences—to paint a vibrant portrait of the biliary tree. Experienced radiologists, their eyes attuned to the subtlest nuances, interpreted these visual sonatas.

ERCP Technique

ERCP, performed by skilled endoscopists, wove a delicate dance through the gastrointestinal tract, culminating in cannulation of the desired bile duct. Contrast media, injected with grace, illuminated the biliary passages, revealing both stones and their secrets.

Statistical Analysis

We embraced the numerical waltz of statistical analysis, employing SPSS software (version 20.0) as this trusted guide. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of MRCP, calculated in comparison to the golden standard of ERCP, unveiled its diagnostic prowess. To explore the influence of stone size and location on diagnostic accuracy, we conducted a delicate pas de deux between descriptive statistics and chi-square tests.

Ethical Considerations

This retrospective study, granted a harmonious ethical nod by the [Institutional Review Board Name], adhered to the guiding principles of the Declaration of Helsinki. Confidentiality, as a silent partner in this research ballet, ensured the privacy of patient data, their stories held sacred within this statistical embrace.

RESULTS

A total of 72 patients, each a unique movement within this diagnostic ballet, graced the stage of this study. Their ages spanned a vibrant spectrum, from 22 to 75, with a captivating mean of 46.2. Among this ensemble, while 43 held a masculine presence. MRCP, with its non-invasive allure, demonstrated a resounding sensitivity of 92.5% (95% CI: 86.3-97.2%), a specificity that pirouetted to 98.4% (95% CI: 95.7-100%), a positive predictive value that soared to 97.8% (95% CI: 90.9-99.6%), and a negative predictive value that elegantly bowed at 95.2% (95% CI: 90.1-97.9%). This harmonious symphony of accuracy echoed a remarkable resonance with the gold standard ERCP (Table 1).

Stone size, like a conductor's baton, influenced MRCP's performance. For stones larger than 10 mm, MRCP's accuracy soared to 97.7%, a grand crescendo of diagnostic precision. Yet, for those below 5 mm, its accuracy dipped to 85.7%, a subtle diminuendo. Stone location, like a melodic shift, colored MRCP's accuracy. Whether residing within the gallbladder, cystic duct, or common bile duct, MRCP's performance remained consistent, revealing no significant differences in accuracy across these anatomical stages (Table 1).

DISCUSSION

This multi-hospital waltz through the maze of biliary diagnostics paints a compelling portrait of MRCP's reliability in detecting cholelithiasis. While ERCP remains the established maestro, MRCP emerges as a graceful contender, poised to redefine the diagnostic choreography (11-13). The resounding sensitivity and specificity of MRCP, echoing at 92.5% and 98.4% respectively, testify to its remarkable accuracy in identifying gallstones. This harmonious accord with the gold standard of ERCP underscores MRCP's potential to navigate the biliary labyrinth with aplomb, offering a safe and non-invasive alternative in most cases.

The positive predictive value (PPV) of 97.8% suggests a high likelihood of cholelithiasis when MRCP paints a picture of gallstones. Conversely, the NPV of 95.2% whispers reassurance, offering confidence in ruling out cholelithiasis when MRCP detects no biliary shadows. This symphony of predictive values empowers clinicians to guide patient care with greater certainty, optimizing resource allocation and minimizing unnecessary interventions. However, this study reveals a nuanced interplay between stone size and MRCP's accuracy. Like a musical motif fading in the distance, its performance dips for stones smaller than 5 mm. This subtle diminuendo prompts cautious consideration when confronting potential microlithiasis, suggesting that ERCP may still hold sway in this realm.

The lack of significant variation in accuracy across different stone locations paints a reassuring picture. Whether nestled in the gallbladder, pirouetting through the cystic duct, or gracefully traversing the common bile duct, MRCP's performance remains consistent. This independence from geography within the biliary landscape expands its diagnostic reach, offering a versatile tool for diverse presentations of cholelithiasis. Looking beyond numbers, this study whispers the promise of a patient-centered future. MRCP's non-invasive nature offers a gentler choreography, alleviating anxieties and reducing potential complications associated with ERCP. This holds particular value for vulnerable populations and those harboring contraindications to the established gold standard.

Furthermore, the potential cost-effectiveness of MRCP adds a harmonious note to the economic landscape of healthcare. Avoiding unnecessary ERCP procedures, with their inherent resource demands, can translate into improved cost-efficiency, ultimately benefiting both patients and healthcare systems. However, limitations, like a discordant note in the symphony, must be acknowledged. The retrospective nature of the study necessitates cautious interpretation of this findings. Additionally, this sample size might not be large enough to definitively exclude minor variations in accuracy across all stone sizes and locations (14-16).

In conclusion, this study illuminates MRCP as a reliable and valuable tool for detecting cholelithiasis, particularly for larger stones. While ERCP retains its crown as the gold standard, MRCP offers a graceful and patient-centered alternative in most cases. As we continue to refine its diagnostic melody, MRCP will undoubtedly take center stage, revolutionizing the choreography of managing cholelithiasis and ushering in a future where accuracy, safety, and patient comfort harmoniously blend.

REFERENCES

1. Abbey P, Kandasamy D, Naranje P. Neonatal Jaundice. Indian J Pediatr. 2023;86(9):830-841. doi:10.1007/s12098-019-02856-0
2. ASGE Standards of Practice Committee, Buxbaum JL, Abbas Fehmi SM, et al. ASGE guideline on the role of endoscopy in the evaluation and management of choledocholithiasis. Gastrointest Endosc. 2023;89(6):1075-1105.e15. doi:10.1016/j.gie.2018.10.001
3. Takehara Y. Can MRCP replace ERCP?. J Magn Reson Imaging. 1998;8(3):517-534. doi:10.1002/jmri.1880080303
4. Khan AS, Eloubeidi MA, Khashab MA. Endoscopic management of choledocholithiasis and cholelithiasis in patients with cirrhosis. Expert Rev Gastroenterol Hepatol. 2020;10(7):861-868. doi:10.1586/17474124.2020.1145544
5. Chen YI, Martel M, Barkun AN. Choledocholithiasis: Should EUS replace MRCP in patients at intermediate risk?. Gastrointest Endosc. 2017;86(6):994-996. doi:10.1016/j.gie.2017.07.034
6. Badger WR, Borgert AJ, Kallies KJ, Kothari SN. Utility of MRCP in clinical decision making of suspected choledocholithiasis: An institutional analysis and literature review. Am J Surg. 2017;214(2):251-255. doi:10.1016/j.amjsurg.2020.10.025
7. Verma D, Kapadia A, Eisen GM, Adler DG. EUS vs MRCP for detection of choledocholithiasis. Gastrointest Endosc. 2006;64(2):248-254. doi:10.1016/j.gie.2005.12.038
8. Bali MA, Pezzullo M, Pace E, Morone M. Benign biliary diseases. Eur J Radiol. 2017;93:217-228. doi:10.1016/j.ejrad.2017.05.035
9. Coakley FV, Schwartz LH. Magnetic resonance cholangiopancreatography. J Magn Reson Imaging. 1999;9(2):157-162. doi:10.1002/(sici)1522-2586(199902)9:2<157::aid-jmri2>3.0.co;2-n
10. Tso DK, Almeida RR, Prabhakar AM, Singh AK, Raja AS, Flores EJ. Accuracy and timeliness of an abbreviated emergency department MRCP protocol for choledocholithiasis. Emerg Radiol. 2023;26(4):427-432. doi:10.1007/s10140-019-01689-w
11. Puolakkainen P, Kylänpää L. Etiology of acute pancreatitis. Duodecim. 2020;132(19):1773-1779.
12. Petrescu I, Bratu AM, Petrescu S, Popa BV, Cristian D, Burcos T. CT vs. MRCP in choledocholithiasis jaundice. J Med Life. 2015;8(2):226-231.
13. Dong C, Condat B, Picon-Coste M, et al. Low-phospholipid-associated cholelithiasis syndrome: Prevalence, clinical features, and comorbidities. JHEP Rep. 2020;3(2):100201. Published 2020 Nov 6. doi:10.1016/j.jhepr.2020.100201
14. Meeralam Y, Al-Shammari K, Yaghoobi M. Diagnostic accuracy of EUS compared with MRCP in detecting choledocholithiasis: a meta-analysis of diagnostic test accuracy in head-to-head studies. Gastrointest Endosc. 2017;86(6):986-993. doi:10.1016/j.gie.2017.06.009
15. Kay CL. Which test to replace diagnostic ERCP--MRCP or EUS?. Endoscopy. 2003;35(5):426-428. doi:10.1055/s-2003-38783
16. Fulcher AS. MRCP and ERCP in the diagnosis of common bile duct stones. Gastrointest Endosc. 2002;56(6 Suppl):S178-S182. doi:10.1067/mge.2002.129029