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Comparative Analysis of MRI and Endoanal Ultrasound for Assessing Perianal Fistulas

Abstract

Perianal fissures can profoundly affect an individual's quality of life, necessitating precise evaluation and treatment. Magnetic Resonance Imaging (MRI) and Endoanal Ultrasound (EAUS) are commonly employed imaging methodologies for appraising perianal fissures. This investigation aimed to juxtapose the precision of diagnosis and the clinical influence of MRI and EAUS in assessing perianal fissures. This retrospective research scrutinized medical records and imaging information from 85 patients diagnosed with perianal fissures. The imaging findings were juxtaposed with surgical observations, regarded as the definitive standard. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of each technique were ascertained through statistical analysis. Endoanal ultrasound detected 96 instances of fistulas, demonstrating an overall sensitivity rate of 84.5% and specificity rate of 36.51%. Meanwhile, MRI pinpointed 85 cases of fistulas, resulting in a sensitivity rate of 72.12% and a specificity rate of 53.69%. Notably, no statistically notable variance emerged between the two methods regarding the precision of diagnosis. MRI and EAUS significantly influenced choices surrounding clinical management, effectively steering the formulation of treatment strategies. The utilization of MRI and EAUS furnished invaluable insights for diagnosing and characterizing perianal fistulas and played an instrumental role in directing decisions about clinical management. Each of these approaches possesses distinct advantages and limitations, and the determination of which to use is contingent upon the unique patient factors and the accessibility of resources. The most effective patient care hinges on an interdisciplinary approach involving radiologists and colorectal surgeons.

Keywords: *Endoanal ultrasound, MRI, Perianal fistula, Diagnosis, Abcess*

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Introduction

Perianal fistulas, a prevalent ailment affecting the anal region, can influence the well-being of those impacted substantially. Accurate evaluation and effective management of these fistulas are pivotal to ensuring the highest level of patient care. Over time, medical imaging methodologies have occupied a central role in identifying and assessing perianal fistulas, aiding healthcare practitioners in making well-judged choices [1-6]. Magnetic Resonance Imaging (MRI) and Endoanal Ultrasound (EAUS) are established imaging techniques routinely utilized to scrutinize perianal fistulas. Both modalities confer distinct advantages and have played a pivotal role in comprehending the intricate anatomy and pathophysiology of perianal fistulas. However, the selection between these methods often hinges on diverse considerations, encompassing availability, cost-effectiveness, and the precise information sought by the clinician [7,8]. The primary objective of this paper is to offer a comprehensive juxtaposition of MRI and EAUS for the evaluation of perianal fistulas. We intend to delve into their respective merits, constraints, and practical utilities, to enhance our grasp of their contributions to the identification, description, and staging of perianal fistulas. Through a comprehensive comprehension of the assets and drawbacks inherent in each approach, healthcare professionals can judiciously determine the preferred imaging method, customizing the diagnostic strategy to align with the distinct clinical circumstances of each patient.

Materials and Methods:

Study Design:

This comparative investigation adopted a retrospective research framework, utilizing medical records and imaging data sourced from patients diagnosed with perianal fistulas. The study took place at a general hospital within the timeframe of 2017 to 2019. Before collecting data, ethical clearance was procured, and due to the study's retrospective nature, the requirement for informed consent was waived.

The MRI images of all enrolled patients were meticulously evaluated by a radiologist with 5 years of experience interpreting abdominopelvic MRI scans. This radiologist specifically focused on identifying perianal fistulas and abscesses within the images. Additionally, endoanal ultrasonography was carried out by a gastroenterologist with a 4-year background in this specific field. The resulting imaging outcomes were subsequently juxtaposed against the established benchmark of surgical findings. For patients who were clinically suspected of having perianal fistulas, endoanal ultrasonography was performed using a Samsung WS80A Ultrasound Machine. The endoanal transducer (operating at a frequency range of 6.7-10 MHz) was employed to assess the presence of fistulas. In the visual output from endoanal

ultrasound imaging, perianal fistulas manifested as hypoechoic grooves situated near the vicinity of the rectum and anal canal. Subsequently, patients underwent MRI scans of the perineal region, encompassing transverse and coronal sections, incorporating a comprehensive array of sequences including T1-weighted, T2-weighted, and post-contrast T1-weighted sequences after the administration of gadolinium contrast. The internal segment of the fistula, in conjunction with granulation tissue, could be identified as a zone exhibiting heightened signal intensity, while the outer segment could be distinguished as fibrous tissue displaying diminished signal intensity. After the imaging procedures were concluded, surgical interventions were executed to address the presence of fistulas. Throughout the surgical process, a meticulous evaluation of the precise location of the fistula tracts, the category of fistulas, and any conceivable complications linked to the fistulas were conducted. In the final phase, the outcomes derived from the imaging analyses were aligned with the surgical findings, facilitating an appraisal of their level of concordance.

For statistical analysis, the Statistical Package for the Social Sciences (SPSS) version 24, developed by SPSS Inc. in Chicago, IL, USA, was employed. Quantitative attributes like age were portrayed in terms of both mean and median values. The efficacy of the tests in detecting perianal fistulas was delineated through metrics such as sensitivity, specificity, positive predictive values (PPV), and negative predictive values (NPV), and these were evaluated with the surgical outcomes regarded as the benchmark standard for comparison.

Results:

This investigation included a total of 85 individuals diagnosed with perianal fistulas. The mean age of the patients stood at 42.84 ± 8.16 years. Among the participants, 17 (20%) were identified as female, while the remaining 68 (80%) were male.

Regarding the application of endoanal ultrasound for perianal fistulas:

During endoanal ultrasound examinations, 96 fistulas were identified among the 85 patients. Among these, 37 (43.5%) cases were categorized as intersphincteric fistulas, 42 (49.4%) as transsphincteric fistulas, and 5 (5.8%) as suprasphincteric fistulas (Table 1).

Endoanal ultrasonography detected 83 out of 96 fistulas later confirmed during surgical procedures. The sensitivity of endoanal ultrasound in detecting perianal fistulas was determined to be 84.5% (with a 95% confidence interval ranging from 76.9% to 95.73%). In comparison, its specificity was measured at 36.51% (with a 95% confidence interval ranging from 11.81% to 88.19%) (as outlined in Table 2). In terms of positive predictive value (PPV) and negative predictive value (NPV), endoanal ultrasound demonstrated estimates of 90.38% (with a 95% confidence interval between 85.5% and 94.23%) and 23.31% (with a 95% confidence interval ranging from 13.28% to 58.01%), respectively. The overall accuracy of endoanal ultrasound in diagnosing perianal fistulas was determined to be 81.25% (with a 95% confidence interval between 72.01% and 91.78%) (as outlined in Table 2).

Regarding the application of MRI for perianal fistulas:

In patients who were clinically suspected of having perianal fistulas, MRI revealed the presence of 85 fistulas. Out of the 96 fistulas that were surgically confirmed, MRI was able to detect 78. The sensitivity of MRI in identifying perianal fistulas was calculated as 72.12% (with a 95% confidence interval ranging from 60.72% to 84.24%), and its specificity was determined as 53.69% (with a 95% confidence interval ranging from 12.81% to 83.19%) (as indicated in Table 2).

Discussion:

The application of medical imaging techniques, encompassing CT scans, ultrasounds, and MRI scans, in the evaluation of diverse medical conditions like pulmonary embolism, carotid intimal plaques, vascular disorders, and neonatal lung issues, is extensively recognized within the medical domain [9-16]. Evaluating perianal fistulas presents a unique diagnostic challenge due to the intricate anatomical structures and the variability in disease manifestations. In this comparative exploration of magnetic resonance imaging (MRI) and endoanal ultrasound (EAUS) for the evaluation of perianal fistulas, both imaging methodologies showcased similar levels of accuracy in identifying and characterizing these anomalies [17-19].

The sensitivity and specificity of both MRI and EAUS in detecting perianal fistulas displayed comparable outcomes, consistent with findings from prior investigations. This conveys that both imaging approaches hold credibility in detecting these abnormalities. However, it's worth highlighting that MRI exhibited a higher positive predictive value than EAUS. This could be attributed to MRI's capability to provide exceptional contrast in soft tissues and its capacity for imaging in multiple planes, enabling a more precise characterization of fistula tracts and their interactions with adjacent structures.

Both MRI and EAUS yielded noteworthy implications for clinical decision-making. These imaging techniques furnished indispensable insights into the precise location, extent, and anatomical attributes of perianal fistulas, thereby facilitating the formulation of treatment strategies and guiding the implementation of surgical procedures. The capacity of MRI and EAUS to significantly influence clinical decisions underscores their significance in enhancing patient outcomes and refining therapeutic approaches. The decision-making process regarding the selection of either MRI or EAUS should

carefully consider factors such as their availability, the level of expertise required, and the specific clinical demands. MRI is a widely accessible imaging technique that offers exceptional resolution for soft tissue details. It is particularly advantageous for comprehensively evaluating intricate perianal fistulas and identifying potential abscesses or deep extensions. Nonetheless, MRI's higher cost and lengthier examination duration might impede its usage in specific healthcare settings [20]. On the other hand, EAUS boasts real-time imaging capabilities and tends to be more cost-effective, positioning it as an appealing choice for routine perianal fistula assessments. Moreover, EAUS can be conveniently performed at the patient's bedside or in outpatient clinics, enabling immediate evaluation and informed decision-making [21].

Acknowledging the limitations inherent in this study is crucial. The retrospective study design inherently introduces biases, and variations in imaging protocols might exert an influence on the obtained results. To bolster the validity of our findings and address these constraints, future prospective investigations incorporating standardized imaging protocols and larger participant cohorts are imperative.

Conclusion:

Both MRI and EAUS furnish valuable insights that facilitate precise diagnoses, detailed anatomical characterizations, and the formulation of effective treatment strategies. The selection between these modalities should be based on the specific attributes of individual patients, the level of local expertise, and the accessibility of resources. Adopting a multidisciplinary approach that involves the collaboration of radiologists and colorectal surgeons is pivotal in harnessing the distinctive strengths of each modality and optimizing the management of individuals afflicted by perianal fistulas.

Declarations

Funding: Not Applicable

Conflict of interest: The authors declare that they have no conflict of interest regarding the contents of this article.

Ethical statements:

The study received approval from the local Ethics Committee, and it was conducted in accordance with the ethical standards established in the Declaration of Helsinki of 1946.

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	Number	Percentage
Type of fistula		
Intersphincteric	37	43.5%
Transsphincteric	42	49.4%
Suprasphincteric	5	5.8%

Table 1: Endoanal ultrasound findings based on fistula type in patients with perianal fistulas.

		Sensitivity	Specificity	PPV	NPV	Accuracy
Perianal fistula	Endoanal ultrasound	84.5%	36.5%	92%	23.31%	81.25%
	MRI	72.12%	53.69%	94%	26.1%	72.28%

Table 2: Crossed table of endoanal ultrasound and MRI results based on surgical findings for Perianal fistula