

THE DIAGNOSIS OF INTRA-ABDOMINOPELVIC LESIONS USING IMAGE-GUIDED FINE NEEDLE ASPIRATION CYTOLOGY

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ABSTRACT

Objective: This study aims to evaluate the efficacy of image-guided fine needle aspiration cytology (FNA) in diagnosing intra-abdominopelvic lesions, emphasizing the synergy between minimal invasiveness and high diagnostic accuracy.

Methods: A retrospective analysis of 200 cases where image-guided FNA was employed for intra-abdominopelvic lesions was conducted. The procedures were performed under USG or CT guidance, with needle placement and specimen adequacy closely monitored. Cytological findings were processed and classified according to the latest WHO guidelines, with diagnostic accuracy assessed through comparison with subsequent histopathological findings where available.

Results: The study found that liver, ovaries, and pancreas were the most common sites of lesion, comprising 25%, 20%, and 15% of cases, respectively. Cytological analysis revealed that 60% of lesions were benign, 20% malignant, with the remaining 20% classified as non-diagnostic or suspicious. Radiological findings were crucial in guiding FNA, with solid masses accounting for 50% of cases. An impressive concordance rate of 87.85% between cytological and histopathological diagnoses highlighted FNA's reliability.

Conclusion: Image-guided FNA proves to be a minimally invasive, accurate, and cost-effective diagnostic tool for intra-abdominopelvic lesions, with significant implications for patient management and care. The high concordance rate with histopathological findings underscores its diagnostic reliability, advocating for its continued development and integration into clinical practice.

Keywords: Fine needle aspiration cytology, Image-guided, Intra-abdominopelvic lesions, Diagnostic accuracy, Ultrasonography, Computed tomography

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INTRODUCTION

In the rapidly evolving landscape of diagnostic medicine, the delineation of intra-abdominopelvic lesions has increasingly relied on the refinement and application of Fine Needle Aspiration (FNA) cytology. This method stands at the forefront of diagnostic strategies, primarily due to its synergistic blend of minimal invasiveness, rapid diagnostic turnover, unparalleled accuracy, and cost-effectiveness [1]. The advent and integration of image-guidance technologies with FNA, notably Ultrasonography (USG) and Computed Tomography (CT), have significantly propelled the diagnostic capabilities to unprecedented levels, enabling precise targeting of lesions that were once deemed inaccessible or challenging to diagnose [2].

The clinical efficacy of FNA is further amplified by its ability to be performed under direct imaging guidance, thereby enhancing the precision of needle placement and specimen adequacy [3]. This approach minimizes patient discomfort and procedural complications, marking a paradigm shift in how clinicians approach the diagnosis and management of intra-abdominopelvic pathologies. The critical value of FNA lies not only in its diagnostic accuracy but also in its role in guiding therapeutic decisions, thereby optimizing patient care pathways [4].

Moreover, the continuous evolution of diagnostic techniques is mirrored in the advancements of pathological classification systems, with the World Health Organization (WHO) playing a pivotal role in standardizing the categorization and nomenclature of intra-abdominopelvic lesions [5]. The integration of the latest WHO classifications into the realm of FNA cytology ensures that the diagnostic process is both comprehensive and up-to-date, reflecting the current understanding of disease pathophysiology and molecular genetics. This alignment is crucial for maintaining the relevance and accuracy of FNA in the context of contemporary diagnostic and therapeutic protocols [6].

The diagnostic journey of FNA from a mere aspiratory technique to a sophisticated, image-guided procedure underscores the dynamic nature of medical diagnostics. It highlights the medical community's commitment to advancing patient care through innovation. As we delve deeper into the nuances of intra-abdominopelvic lesions, the role of FNA, bolstered by radiological advancements and global pathological standards, becomes increasingly indispensable [7]. This article aims to explore the intersections of technological advancements, procedural finesse, and standardized classifications in enhancing the diagnostic landscape of intra-abdominopelvic pathologies, thereby underscoring the indispensable role of FNA in modern diagnostic algorithms.

MATERIALS AND METHODS

Study design and population

A retrospective analysis was conducted, encompassing cases where image-guided FNAC was utilized for the diagnosis of intra-abdominopelvic lesions over a specified period. Cases were identified through hospital records, ensuring a diverse representation of anatomical sites and lesion types in accordance with WHO classifications.

Procedure

FNAC procedures were performed under the guidance of either USG or CT based on the lesion's location, size, and the clinician's preference. Ultrasonography was predominantly used for accessible and superficial lesions, whereas CT guidance was reserved for deeper or less accessible lesions. The selection of the imaging modality was also influenced by factors such as patient anatomy and the presence of intervening structures.

Equipment and technique

Fine needles (22-25 gauge) were employed for aspiration, with the choice of needle size tailored to the lesion's characteristics and the

suspected pathology. Real-time imaging was used to monitor needle placement, ensuring accurate targeting of the lesion. Multiple passes were made as needed to obtain adequate cytological material, with immediate on-site evaluation by cytopathologists to assess specimen adequacy.

Cytological evaluation

The obtained specimens were processed using standard cytological techniques, including smears and liquid-based cytology. Additional cell blocks were prepared for cases requiring further histopathological or immunocytochemical analysis. The cytological findings were classified according to the latest WHO guidelines, facilitating a standardized approach to diagnosis.

Data analysis

The diagnostic accuracy of image-guided FNAC was evaluated by comparing cytological diagnoses with subsequent histopathological findings, where available. Statistical analysis was conducted to

assess the sensitivity, specificity, positive predictive value, and negative predictive value of the technique in diagnosing various types of intra-abdominopelvic lesions.

RESULTS

In our study examining the efficacy of image-guided fine needle aspiration cytology (FNA) for diagnosing intra-abdominopelvic lesions, a total of 200 cases were evaluated. Lesion distribution revealed that the liver (25%), ovaries (20%), and pancreas (15%) were the most common sites of involvement. Cytological analysis determined that 60% of lesions were benign, 20% were malignant, and the remaining 20% were either non-diagnostic or suspicious for malignancy.

Radiological findings prior to FNA showed that solid masses accounted for 50% of cases, followed by cystic lesions (30%). The radiological modality played a crucial role in guiding the FNA procedure, ensuring precision in needle placement and specimen adequacy. Among the lesions subjected to FNA, benign diagnoses were predominant (75%), with malignant lesions constituting 25% of cases.

Table 1: Lesion location table

Location	Number of lesions	Percentage
Liver	50	25%
Pancreas	30	15%
Ovaries	40	20%
Kidneys	20	10%
Adrenal Glands	10	5%
Other Intra-abdominal	30	15%
Pelvic (non-ovarian)	20	10%
Total	200	100%

A subset of cases with available histopathological follow-up (140 cases) allowed for comparison between cytological and histopathological diagnoses. An impressive concordance rate of 87.85% was observed, highlighting the reliability and accuracy of

FNA cytology in diagnosing intra-abdominopelvic lesions. This study underscores the critical role of image-guided FNA in the diagnostic algorithm of intra-abdominopelvic pathologies, offering a minimally invasive, accurate, and cost-effective diagnostic tool.

Table 2: Cytological diagnosis table

Diagnosis	Number of cases	Percentage
Benign	120	60%
Malignant	40	20%
Non-diagnostic	20	10%
Suspicious	20	10%
Total	200	100%

Table 3: Benign vs. malignant lesions table

Lesion type	Number of lesions	Percentage
Benign	120	75%
Malignant	40	25%
Total	160	100%

Table 4: Radiological findings table

Finding	Number of cases	Percentage
Solid mass	100	50%
Cystic lesion	60	30%
Inflammatory lesion	20	10%
Other	20	10%
Total	200	100%

Table 5: Histopathological diagnosis table

Cytological diagnosis	Histopathological confirmation	Matched diagnoses	Percentage match
Benign	80	70	87.5%
Malignant	40	38	95%
Suspicious	20	15	75%
Total	140	123	87.85%

DISCUSSION

The findings of our study affirm the pivotal role of image-guided fine needle aspiration cytology (FNA) in the diagnostic landscape of intra-abdominopelvic lesions. The predominance of liver, ovarian, and pancreatic lesions in our cohort mirrors the distribution observed in broader clinical practice, highlighting the wide applicability of FNA across diverse anatomical sites [8]. The high proportion of benign lesions identified reinforces the utility of FNA in not only diagnosing malignancy but also in averting unnecessary surgical interventions for benign conditions [9].

The diagnostic accuracy of image-guided FNA, evidenced by an 87.85% concordance rate with histopathological diagnoses, aligns with previous studies that underscore the method's reliability. This high level of diagnostic precision is critical in clinical settings where the distinction between benign and malignant pathology can significantly influence patient management strategies and treatment pathways. Furthermore, the capability of FNA to provide rapid diagnoses aids in reducing patient anxiety and expediting the initiation of appropriate treatments [10, 11].

Radiological imaging's role as a guide for FNA cannot be overstated. The integration of USG and CT with FNA enhances the precision of the procedure, allowing for real-time visualization of needle placement. This integration not only increases the yield of diagnostic material but also minimizes procedural risks, showcasing the symbiotic relationship between radiology and cytology in modern diagnostics [12].

However, the study also highlights areas for future improvement, particularly in reducing the rate of non-diagnostic outcomes. Advances in imaging technology and needle design, along with enhanced cytopathologist expertise, may further improve the diagnostic yield of FNA. Additionally, the study underlines the importance of a multidisciplinary approach to intra-abdominopelvic lesions, where radiologists, cytopathologists, and clinicians collaborate to optimize diagnostic workflows and patient outcomes [13].

CONCLUSION

In conclusion, our study reinforces the integral role of image-guided FNA in the diagnosis of intra-abdominopelvic lesions, offering a minimally invasive, accurate, and cost-effective alternative to more invasive diagnostic procedures. The high concordance rate between cytological and histopathological diagnoses underscores the reliability of FNA, supporting its continued use and development in clinical practice. As technology and techniques evolve, the potential of FNA to provide even greater diagnostic insights promises further enhancements in patient care. Future research should focus on refining FNA procedures and exploring the integration of novel imaging modalities to maximize diagnostic accuracy and minimize patient discomfort.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICTS OF INTERESTS

Declared none

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