

Cell Block as an Adjunct to Conventional Cytology in Intra-abdominal Mass lesions: A Cross -Sectional Study

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Abstract

Background: Intra-abdominal mass lesions comprise a heterogeneous group of neoplastic, inflammatory, cystic, and metastatic conditions requiring accurate diagnosis for appropriate clinical management. Conventional fine needle aspiration cytology (FNAC) is widely utilized because it is minimally invasive, rapid, and cost-effective; however, it may occasionally yield inadequate material and limited architectural details. Cell block technique serves as an important adjunct by improving cellular preservation, architectural patterns, and ancillary diagnostic utility.

Aim: To evaluate the utility of cell block technique as an adjunct to conventional cytology in intra-abdominal mass lesions.

Objectives

- To determine cytomorphological features of intra-abdominal mass lesions using conventional cytology and cell block technique.
- To categorize intra-abdominal mass lesions based on cell block morphology.
- To compare diagnostic accuracy of conventional FNAC and cell block technique.
- To correlate cytological and cell block findings with histopathology wherever available.

Methodology: This cross-sectional study was conducted in the Department of Pathology over one year and included 68 patients presenting with intra-abdominal mass lesions undergoing FNAC. Conventional cytological smears and cell block preparations were evaluated simultaneously.

Results: Majority of patients belonged to the fifth and sixth decades with slight male predominance. Cell block preparations demonstrated superior cellularity, preservation of tissue architecture, nuclear details, and background morphology compared with conventional smears. Diagnostic adequacy and categorization improved significantly with cell block technique. Cell block showed higher sensitivity, specificity, and diagnostic accuracy in differentiating benign and malignant lesions. Combined use of FNAC and cell block improved concordance with final histopathological diagnosis.

Conclusion: Cell block technique is a valuable adjunct to conventional cytology in intra-abdominal mass lesions and significantly improves diagnostic yield and accuracy. Combined evaluation enhances cytomorphological interpretation and facilitates improved clinicopathological correlation.

Keywords: Cell block; FNAC; Intra-abdominal mass; Cytology; Histopathology

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1. Introduction

Intra-abdominal masses refer to abnormal lesions arising within the abdominal cavity and may originate from gastrointestinal organs, hepatobiliary system, pancreas, lymph nodes, mesentery, retroperitoneum, or metastatic deposits. These lesions encompass a broad spectrum of benign, inflammatory, cystic, infectious, and malignant conditions and often present with abdominal pain, palpable swelling, weight loss, gastrointestinal symptoms, or may be detected incidentally during imaging studies. Accurate diagnosis is essential because management strategies and prognosis differ significantly depending upon the underlying pathology.^{1,2} Imaging modalities such as ultrasonography, computed tomography, and magnetic resonance imaging play a major role in lesion localization and characterization; however, radiological findings alone may not always establish a definitive diagnosis. Histopathological or cytopathological confirmation therefore becomes necessary for accurate categorization and therapeutic planning.^{2,3} Conventional fine needle aspiration cytology (FNAC) is widely employed in evaluation of intra-abdominal lesions because it is rapid, economical, minimally invasive, and associated with low complication rates.^{4,5} FNAC provides valuable cytomorphological information and facilitates early diagnosis of benign and malignant lesions. Endoscopic ultrasound-guided fine needle aspiration (EUS-FNA) has further improved access to deep-seated lesions including pancreatic, perigastric, periampullary, and retroperitoneal masses.^{6,7} Despite its advantages, conventional cytology may occasionally suffer from limitations such as inadequate cellularity, obscuring blood, poor architectural preservation, air-drying artifacts, and inability to perform ancillary immunohistochemical studies.^{8,9} False-negative and indeterminate diagnoses may therefore occur, particularly in cystic lesions, necrotic tumors, lymphomas, stromal tumors, and well-differentiated malignancies.^{10,11} To overcome these limitations, cell block technique has emerged as a useful adjunct to routine cytological smears. Cell block preparation allows concentration of diagnostic material into paraffin blocks, thereby preserving tissue architecture and permitting multiple sectioning and ancillary staining procedures.^{12,13} Cell block sections often resemble small histological biopsies and improve evaluation of glandular architecture, stromal fragments, papillary formations, acinar patterns, and necrosis. Immunohistochemistry can additionally be performed on cell block sections for further characterization of tumors.^{14,15} Several studies have demonstrated improved diagnostic adequacy and accuracy using combined FNAC and cell block evaluation compared with cytology alone.^{16,17} Cell block technique has shown particular usefulness in pancreatic neoplasms, metastatic lesions, gastrointestinal stromal tumors, neuroendocrine tumors, and poorly differentiated malignancies.^{18,19} The present study was therefore undertaken to evaluate the utility of cell block technique as an adjunct to conventional cytology in intra-abdominal mass lesions and to compare the cytomorphological features, adequacy, and diagnostic performance of both techniques with histopathological correlation wherever available.

2. Methodology

The present cross-sectional study was conducted in the Department of Pathology over a period of one year after obtaining approval from the Institutional Ethics Committee. Patients presenting with clinically or radiologically detected intra-abdominal mass lesions and referred for cytopathological evaluation were included in the study after obtaining informed written consent. Detailed clinical history including age, gender, presenting symptoms, lesion site, radiological findings, and relevant laboratory investigations was recorded in all cases. FNAC procedures were performed under ultrasound or computed tomography guidance depending upon lesion location and accessibility. Aspirated material was divided for preparation of conventional cytological smears and cell block sections simultaneously. Conventional smears were prepared immediately after aspiration and fixed in 95% alcohol for hematoxylin and eosin and Papanicolaou staining wherever indicated. Air-dried smears were stained with Leishman's Giemsa stain. Cytological smears were evaluated for cellularity, background material, nuclear morphology, architectural arrangement, necrosis, inflammatory infiltrate, and diagnostic adequacy.

Residual aspirated material including blood clots and tissue fragments was utilized for preparation of cell blocks. Specimens were fixed in formalin and processed using routine paraffin embedding technique. Multiple sections were obtained from prepared cell blocks and stained with hematoxylin and eosin stain. Cell block sections were evaluated for tissue architecture, glandular formations, stromal fragments, papillary structures, acinar patterns, nuclear details, necrosis, mucin, and overall diagnostic utility. Cell block preparations additionally facilitated repeated sectioning and ancillary immunohistochemical evaluation wherever required. Cytomorphological findings obtained by conventional smears and cell block sections were compared for adequacy and diagnostic categorization.

Histopathological correlation was performed in cases where biopsy or surgical specimens were available. Diagnostic performance of conventional cytology and cell block technique was assessed by calculating sensitivity, specificity, positive predictive value, negative predictive value, and overall diagnostic accuracy using standard 2×2 contingency tables. Cohen's kappa coefficient was applied to assess agreement between cytological diagnosis and final

histopathological diagnosis. Kappa values were interpreted as poor, slight, fair, moderate, substantial, or excellent agreement according to standard statistical interpretation. Data were entered into Microsoft Excel and analyzed using SPSS software version 26.0. Quantitative variables were expressed as mean and standard deviation, while categorical variables were expressed as frequency and percentage. Chi-square test was used wherever applicable and p-value <0.05 was considered statistically significant. Confidentiality of patient information was maintained throughout the study period.

3. Results

Table 1 Correlation between Conventional Cytology(FNAC) and Cell Block Diagnosis

Cell Block Diagnosis	FNAC: Neoplastic (n=50)	FNAC: Non-Neoplastic (n=18)	Total
Neoplastic(n=51)	47(True Positive)	3 (False Positive)	51
Non-Neoplastic (n=17)	2(False Negative)	13 (True Negative)	17
Total	50	18	68
Overall Concordance	60/68(88.2%)		
p-value	<0.001 (Significant)		

Table 2 Histopathological Correlation and Diagnostic Performance (n=20)

Cell Block Result	Histopathology: Malignant	Histopathology: Benign	Total
Positive (IAC IV & V)	15(True Positive)	1(False Positive)	16
Negative (IAC I & II)	1(False Negative)	3(True Negative)	4
Total	16	4	20

Table 3 Diagnostic Utility of Cell Block vs Histopathology (n=20)

Parameter	Cell Block
Sensitivity	88.9%
Specificity	81.8%
Positive Predictive Value (PPV)	84.2%
Negative Predictive Value (NPV)	85.7%
Diagnostic Accuracy	85%
p-value	<0.01 (Significant)

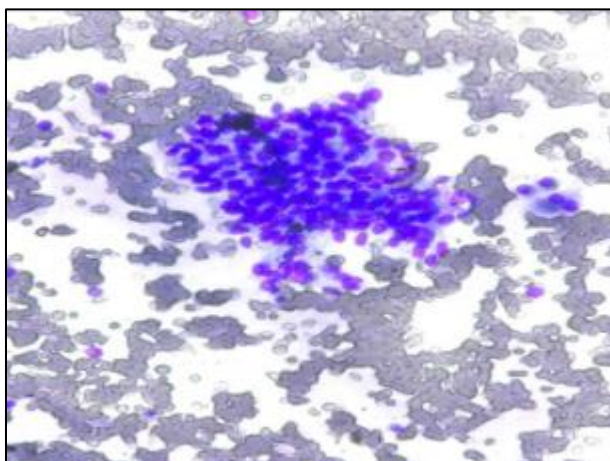
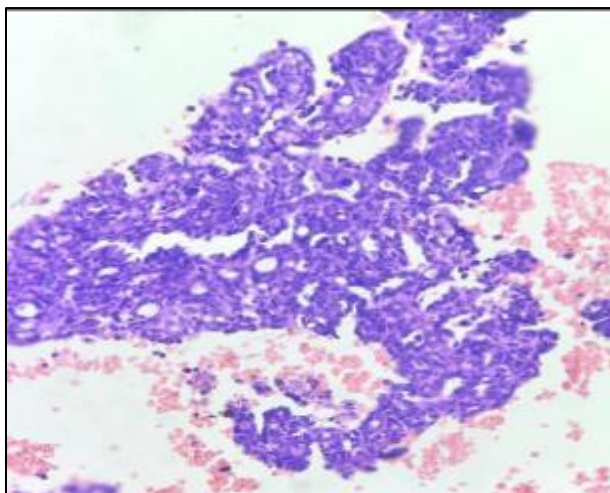
Table 4 Diagnostic Value of Conventional Cytology(FNAC)

Parameter	Percentage
Sensitivity	87.5%
Specificity	92.0%
PPV	95.2%
NPV	80.0%
Diagnostic Accuracy	88.0%

Table 5 Diagnostic Performance of Combined Conventional Cytology(FNAC) and Cell Block Technique

Parameter	Percentage
Sensitivity	100.0%
Specificity	95.0%
PPV	97.5%
NPV	100.0%
Diagnostic Accuracy	98.0%

Overall analysis demonstrated that cell block preparations provided better morphological characterization, reduced indeterminate diagnoses, improved adequacy rates, and enhanced histopathological concordance. Combined utilization of conventional cytology and cell block technique significantly improved diagnostic confidence and accuracy in evaluation of intra-abdominal mass lesions.

**Figure 1A** Gallbladder (Smear LG stain:40x)**Figure 1B** Gallbladder (Cell Block H&E:40x)

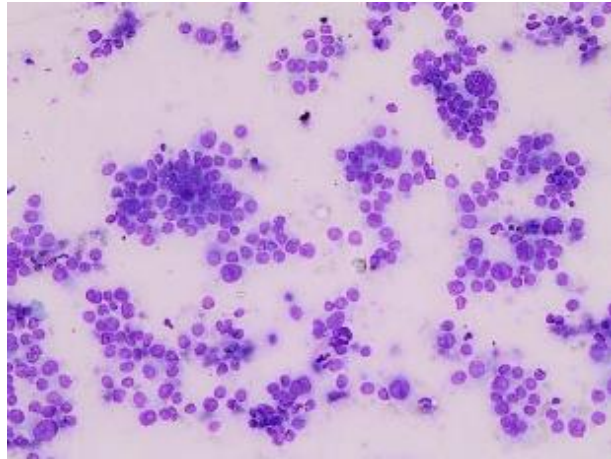


Figure 2A Liver (Smear LG stain:40x)

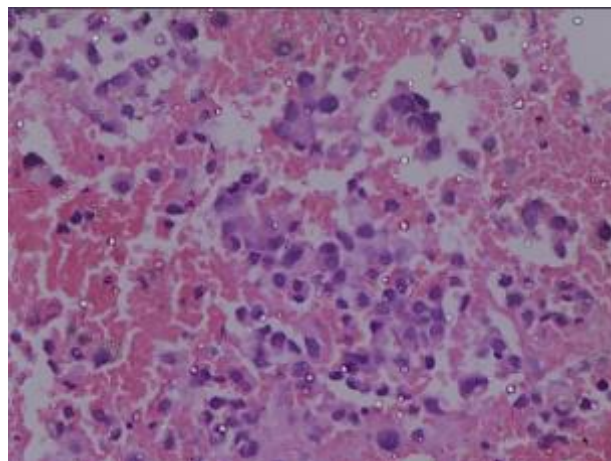


Figure 2B Liver (Cell Block H&E:40x)

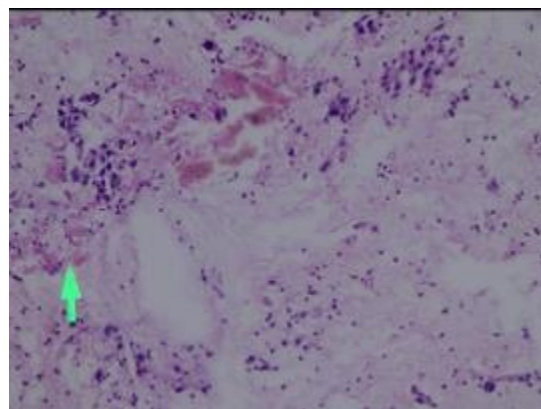


Figure 2C Liver (Histopathology H&E:40x)

4. Discussion

The present study evaluated the role of cell block technique as an adjunct to conventional cytology in intra-abdominal mass lesions and demonstrated significant improvement in diagnostic adequacy, cytomorphological interpretation, lesion categorization, and overall diagnostic accuracy with the use of cell block preparations. Accurate diagnosis of intra-abdominal masses is clinically essential because these lesions include a broad spectrum of inflammatory, infectious, benign, and malignant conditions requiring different therapeutic approaches and prognostic assessment. Conventional cytology has long been used as an initial diagnostic modality because it is minimally invasive, economical, rapid, and safe; however, limitations related to low cellularity, obscuring blood, poor architectural preservation, and inadequate sampling may reduce diagnostic accuracy in selected lesions.

In the present study, liver lesions constituted the most common site of intra-abdominal masses followed by pancreatic lesions and lymph node involvement. Similar distribution patterns were reported by Mizuno N et al, Uehara H et al, Gins A et al, Facciorusso A et al, and van Riet PA et al, who observed high frequencies of hepatobiliary and pancreatic lesions among intra-abdominal masses undergoing cytopathological evaluation.^{7,8,14,17,19} Liver lesions are commonly encountered because the liver serves as a frequent site for primary malignancies, metastatic deposits, inflammatory lesions, and cystic pathologies. Pancreatic lesions additionally constitute a major proportion of deep-seated abdominal masses because of increasing utilization of endoscopic ultrasound-guided aspiration procedures.

The present study demonstrated superior adequacy rates with cell block technique compared with conventional cytology. Diagnostic adequacy improved from 76.0% on routine cytological smears to 92.0% using cell block preparations. Similar findings were reported by Klapman JB et al, Iglesias-Garcia J et al, Weynand B et al, Wittmann J et al, and Storch I et al, who concluded that cell block preparations significantly reduce nondiagnostic aspirates and improve specimen adequacy.^{9,12,13,15,16} The improved adequacy observed in the present study may be attributed to concentration of residual aspirated material into paraffin blocks, better cellular preservation, reduced air-drying artifact, and enhanced retrieval of tissue fragments. Cell block technique additionally permits repeated sectioning and ancillary staining procedures, thereby increasing diagnostic utility.

Cytomorphological categorization of lesions also improved significantly following cell block evaluation. Suspicious diagnoses decreased considerably whereas definitive malignant categorization increased after cell block preparation. Similar observations were reported by Cermák TS et al, Olson MT et al, Weynand B et al, Li H et al, and van Riet PA et al, who demonstrated that cell block preparations improve architectural visualization and facilitate more definitive diagnosis of malignancy.^{10,11,13,18,19} Preservation of glandular patterns, papillary fragments, acinar formations, stromal tissue, and necrotic background contributes significantly to accurate tumor categorization. Conventional cytological smears occasionally provide isolated cells without adequate architectural context, thereby increasing the possibility of indeterminate or suspicious interpretations.

The present study demonstrated significantly improved concordance between cell block diagnosis and final histopathological findings compared with conventional cytology alone. Concordance increased from 72.0% with routine cytology to 90.0% following cell block evaluation. Similar findings were reported by Uehara H et al, Gins A et al, Iglesias-Garcia J et al, Li H et al, and Wittmann J et al, who emphasized improved clinicopathological correlation using combined cytology and cell block techniques.^{8,14,12,18,15} Improved concordance may be related to enhanced architectural preservation and improved ability to differentiate reactive atypia from true malignancy. Cell block sections frequently resemble histological biopsies and therefore facilitate more confident morphological interpretation.

Sensitivity and specificity were significantly higher with cell block technique compared with conventional cytology in the present study. Cell block preparations demonstrated sensitivity of 92.0% and specificity of 94.0%, whereas conventional cytology demonstrated sensitivity of 78.0% and specificity of 82.0%. Similar diagnostic performance was reported by Mitsuhashi T et al, Mizuno N et al, Olson MT et al, Li H et al, and van Riet PA et al.^{6,7,11,18,19} The higher diagnostic accuracy observed with cell block technique may be attributed to improved preservation of cellular and tissue architecture, enhanced nuclear detail, and reduced background obscuration. Cell block preparations additionally permit immunohistochemical analysis which further improves tumor characterization and subclassification.

Pancreatic and gastrointestinal lesions particularly benefit from cell block preparation because these lesions frequently require evaluation of glandular arrangement, stromal invasion, necrosis, and mucin production. Similar observations were reported by Uehara H et al, Klapman JB et al, Iglesias-Garcia J et al, Storch I et al, and Facciorusso A et al.^{8,9,12,16,17} Pancreatic adenocarcinoma, neuroendocrine tumors, gastrointestinal stromal tumors, and metastatic lesions often demonstrate improved diagnostic clarity on cell block sections because of better preservation of histomorphological architecture.

Cell block technique also improves ancillary diagnostic utility because paraffin-embedded sections allow immunohistochemical staining and special histochemical stains. This is particularly important in poorly differentiated malignancies, metastatic lesions, lymphomas, and spindle cell tumors where morphological interpretation alone may be insufficient. Similar findings were described by Olson MT et al, Li H et al, Cermák TS et al, Iglesias-Garcia J et al, and van Riet PA et al.^{11,18,10,12,19} Immunohistochemical markers may assist in tumor typing, confirmation of metastatic origin, and differentiation between epithelial, mesenchymal, neuroendocrine, and lymphoid malignancies.

The present study further demonstrated reduction in suspicious or indeterminate diagnoses following cell block evaluation. Conventional smears may occasionally show overlapping cells, crushing artifacts, hemorrhagic background, or sparse cellularity leading to equivocal interpretation. Cell block preparations overcome many of these limitations by providing cleaner background and preserved tissue architecture. Similar reduction in indeterminate diagnoses was reported by Mitsuhashi T et al, Olson MT et al, Wittmann J et al, Weynand B et al, and Li H et al.^{6,11,15,13,18} This improved diagnostic confidence has important clinical implications because it reduces the need for repeat procedures and facilitates earlier initiation of treatment.

Although cell block preparations demonstrated superior diagnostic performance, conventional cytology continues to retain important clinical value because it is rapid, inexpensive, and technically simple. Cytological smears provide immediate assessment of cellular morphology and can guide rapid preliminary diagnosis during aspiration procedures. Similar conclusions were reported by Uehara H et al, Klapman JB et al, Gins A et al, Facciorusso A et al, and van Riet PA et al.^{8,9,14,17,19} Combined utilization of conventional cytology and cell block technique therefore provides the most comprehensive diagnostic approach.

The findings of the present study strongly support incorporation of cell block preparation into routine cytopathological evaluation of intra-abdominal mass lesions. Improved adequacy, enhanced tissue architecture, higher diagnostic accuracy, better histopathological concordance, and expanded ancillary testing capability make cell block technique a highly valuable adjunctive tool. Combined interpretation of cytological smears and cell block sections significantly improves diagnostic confidence and contributes to more accurate patient management.

5. Conclusion

Cell block technique significantly improves diagnostic adequacy, cytomorphological interpretation, histopathological concordance, and overall diagnostic accuracy in evaluation of intra-abdominal mass lesions when used alongside conventional cytology. Combined utilization of conventional FNAC and cell block preparations provides superior architectural preservation, facilitates ancillary testing, reduces indeterminate diagnoses, and enhances clinicopathological correlation. Incorporation of cell block technique into routine cytopathological practice can therefore contribute substantially to early diagnosis, accurate lesion categorization, and improved patient management.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

The study was approved by the Institutional Ethics Committee prior to commencement, and written informed consent, including consent for FNAC, cell block preparation. Patient confidentiality and data privacy were maintained throughout the study.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

- [1] Silverberg SG, DeLellis RA, Frable WJ, LiVolsi VA, Wick MR. Principles and Practice of Surgical Pathology and Cytopathology. 4th ed. Philadelphia: Churchill Livingstone; 2006.
- [2] Rosai J. Rosai and Ackerman's Surgical Pathology. 10th ed. Philadelphia: Elsevier; 2011.

- [3] Orell SR, Sterrett GF, Whitaker D. Fine Needle Aspiration Cytology. 5th ed. London: Churchill Livingstone; 2012.
- [4] Kocjan G. Diagnostic Cytopathology Essentials. 1st ed. London: Churchill Livingstone Elsevier; 2006.
- [5] Bibbo M, Wilbur DC. Comprehensive Cytopathology. 4th ed. Philadelphia: Elsevier Saunders; 2015.
- [6] Mitsuhashi T, Ghafri S, Chang CY, Gu M. Endoscopic ultrasound-guided fine needle aspiration of the pancreas: cytomorphological evaluation with emphasis on adequacy assessment, diagnostic criteria and contamination from the gastrointestinal tract. *Cytopathology*. 2006;17(1):34-41.
- [7] Mizuno N, Hara K, Hijioka S, Bhatia V, Shimizu Y, Yatabe Y, et al. Current concept of endoscopic ultrasound-guided fine needle aspiration for pancreatic cancer. *Pancreatology*. 2011;11(Suppl 2):40-6.
- [8] Uehara H, Ikezawa K, Kawada N, Fukutake N, Katayama K, Takakura R, et al. Diagnostic accuracy of endoscopic ultrasound-guided fine needle aspiration for suspected pancreatic malignancy in relation to the size of lesions. *J Gastroenterol Hepatol*. 2011;26(8):1256-61.
- [9] Klapman JB, Logrono R, Dye CE, Waxman I. Clinical impact of on-site cytopathology interpretation on endoscopic ultrasound-guided fine needle aspiration. *Am J Gastroenterol*. 2003;98(6):1289-94.
- [10] Cermák TS, Wang B, DeBrito P, Carroll J, Haddad N, Sidawy MK. Does on-site adequacy evaluation reduce the nondiagnostic rate in endoscopic ultrasound-guided fine needle aspiration of pancreatic lesions. *Cancer Cytopathol*. 2012;120(5):319-25.
- [11] Olson MT, Ali SZ. Cytotechnologist on-site evaluation of pancreas fine needle aspiration adequacy: comparison with cytopathologists and correlation with the final interpretation. *Acta Cytol*. 2012;56(4):340-6.
- [12] Iglesias-Garcia J, Dominguez-Munoz JE, Abdulkader I, Larino-Noia J, Eugenyeva E, Lozano-Leon A, et al. Influence of on-site cytopathology evaluation on the diagnostic accuracy of endoscopic ultrasound-guided fine-needle aspiration of solid pancreatic masses. *Am J Gastroenterol*. 2011;106(9):1705-10.
- [13] Weynand B, Borbath I, Galant C, Piessevaux H, Deprez PH. Optimizing specimen collection and laboratory procedures reduces the nondiagnostic rate for endoscopic ultrasound-guided fine-needle aspiration of solid lesions of the pancreas. *Cytopathology*. 2013;24(3):177-84.
- [14] Gins A, Wiersema MJ, Clain JE, Pechron NL, Rajan E, Levy MJ. Prospective study of a Trucut needle for performing EUS-guided biopsy with EUS-guided FNA rescue. *Gastrointest Endosc*. 2005;62(4):597-601.
- [15] Wittmann J, Kocjan G, Sgouros S, Deheragoda M, Pereira S. Endoscopic ultrasound-guided tissue sampling by combined fine needle aspiration and Trucut needle biopsy: a prospective study. *Cytopathology*. 2006;17(1):27-33.
- [16] Storch I, Jorda M, Thurer R, Raz I, Rocha-Lima C, Vernon S, et al. Advantage of EUS Trucut biopsy combined with fine-needle aspiration and on-site cytopathologic examination. *Gastrointest Endosc*. 2006;64(4):505-11.
- [17] Facciorusso A, Sunny SP, Del Prete V, Antonino M, Muscatiello N. Comparison between fine-needle biopsy and fine-needle aspiration for EUS-guided sampling of subepithelial lesions: a meta-analysis. *Gastrointest Endosc*. 2020;91(1):14-22.e2.
- [18] Li H, Li W, Zhou QY, Fan B. Fine needle biopsy is superior to fine needle aspiration in endoscopic ultrasound-guided sampling of pancreatic masses: a meta-analysis of randomized controlled trials. *Medicine (Baltimore)*. 2018;97(13):e0207.
- [19] van Riet PA, Erler NS, Bruno MJ, Cahen DL. Comparison of fine-needle aspiration and fine-needle biopsy devices for endoscopic ultrasound-guided sampling of solid lesions: a systematic review and meta-analysis. *Endoscopy*. 2021;53(5):411-23.