Original Article

Transrectal contrast-enhanced ultrasound-guided transperineal core-needle biopsy versus endoscopic forceps biopsy in the diagnosis of complex rectal lesions

Qiong Zhang, Tingting Qiu, Hua Zhuang, Youxiang Ren, Wenwu Ling, Yan Luo

Department of Medical Ultrasound, West China Hospital, Sichuan University, Chengdu, China

Contributions: (I) Conception and design: Q Zhang, W Ling, Y Luo; (II) Administrative support: W Ling, Y Luo; (III) Provision of study materials or patients: H Zhuang; (IV) Collection and assembly of data: T Qiu, Y Ren; (V) Data analysis and interpretation: Q Zhang, W Ling, Y Luo; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Wenwu Ling, MD; Yan Luo, MD. Department of Medical Ultrasound, West China Hospital, Sichuan University, No. 37 Guoxue Alley, Chengdu 610041, China. Email: lingwenwubing@163.com; yanluo@scu.edu.cn.

Background: The preoperative pathological diagnosis of rectal lesions is crucial for formulating treatment plans. For subepithelial lesions (SELs) and larger lesions with necrosis of the rectum, endoscopic forceps biopsy (EFB) cannot provide an accurate pathological diagnosis in most cases. By comparing the efficacy and safety of transrectal contrast-enhanced ultrasound-guided transperineal core-needle biopsy (TRCEUS-TP-CNB) and EFB, this study explored the value of TRCEUS-TP-CNB in the diagnosis of complex rectal lesions, such as SELs.

Methods: A retrospective, cross-sectional study was conducted with 32 consecutive patients with complex rectal lesions admitted to our hospital from May 2016 to June 2022. Clinical, ultrasound, and pathological data were collected from these patients who underwent EFB followed by TRCEUS-TP-CNB.

Results: The success rate of EFB was 21.88% (7/32) and that of TRCEUS-TP-CNB was 93.75% (30/32). No significant complications were observed for either biopsy method. Factors affecting the success rate of EFB included the lesion width (cm) (1.90±0.62 *vs.* 4.26±2.40, P<0.001) and lesion thickness (cm) (1.29±0.51 *vs.* 2.96±1.75, P<0.001). The success rate of TRCEUS-TP-CNB was not affected by these factors. In the paired study of TRCEUS-TP-CNB and EFB, the times of samples per person (1 *vs.* 2.14±0.90, P=0.015), number of specimens per sample (8.27±1.93 *vs.* 3.31±1.67, P<0.001), lesion width (cm) (3.79±2.42 *vs.* 1.90±0.62, P=0.001), and lesion thickness (cm) (2.64±1.75 *vs.* 1.29±0.51, P=0.001) were the factors affecting the difference of the sampling success rate. In the SELs, the success rate of EFB was 10% (1/10) and that of TRCEUS-TP-CNB was 100% (10/10), and the difference between the two groups was statistically significant (P=0.004).

Conclusions: TRCEUS-TP-CNB is an effective biopsy method for complex rectal lesions. The success rate of EFB is lower in the larger lesions. Compared with EFB, TRCEUS-TP-CNB required fewer times of samples be taken and obtained more specimens. For larger lesions and SELs of the rectum, TRCEUS-TP-CNB is expected to become one of the preferred biopsy methods.

Keywords: Transperineal core-needle biopsy (TP-CNB); biplane transrectal ultrasonography; contrast-enhanced ultrasound (CEUS); rectal lesions; endoscopic forceps biopsy (EFB)

Submitted Oct 17, 2023. Accepted for publication Jan 23, 2024. Published online Mar 15, 2024.
doi: 10.21037/qims-23-1451
View this article at: https://dx.doi.org/10.21037/qims-23-1451

Introduction

The pathological types of rectal lesions are diverse (1), and the treatment and prognosis of different pathological types of lesions differ significantly (2,3). Therefore, preoperative pathological diagnosis is very important (4,5). Endoscopic forceps biopsy (EFB) is the first-line method usually used to obtain pathological specimens of rectal lesions (6,7), and to treat and remove lesions smaller than 1 cm (8). Subepithelial lesions (SELs) refer to lesions located below the epithelial layer, originating from the gastrointestinal wall or caused by external compression of adjacent organs (5). Due to the subepithelial location of the lesions, EFB cannot provide diagnostic tissue in most cases (2). Endoscopic ultrasound is a useful way to evaluate SELs (9), and the histological diagnosis can be accomplished by endoscopic ultrasound-guided biopsy (10). However, the sampling success rate of endoscopic ultrasound varies greatly in the literature (7,11-13), ranging from 60% to 93% (11,14-16). Although transrectal ultrasound-guided transrectal biopsy has a diagnosis rate of more than 90% for rectal lesions (1,17), complications such as bleeding (18,19) and infection (20-25) are common. Moreover, all three above-mentioned methods are types of transrectal biopsy, which requires a preoperative cleaning enema, as well as the perioperative use of antibiotics (17-26), leading to an increase in intestinal bacteria resistance (25,27). Thus, a safe and effective biopsy technique is needed with low complications, a high diagnostic rate, and stable reliability for the diagnosis of rectal lesions.

Compared to transrectal biopsy, transperineal biopsy has a lower risk of fever and bleeding, and does not require the intestinal preparation and perioperative use of antibiotics (28). Therefore, transrectal ultrasound-guided transperineal biopsy is widely used in the diagnosis of prostate diseases (25,29-32); however, there are very few reports on the use of this technique in the diagnosis of rectal lesions (33,34). In addition, contrast-enhanced ultrasound (CEUS) clearly shows enhanced areas of non-liquefied necrosis in the lesion, significantly increasing the positive rate of biopsy (35). To the best of our knowledge, the use of transrectal contrast-enhanced ultrasound-guided transperineal core-needle biopsy (TRCEUS-TP-CNB) in rectal lesions has only been reported in a few cases (34). To date, no study comparing the use of TRCEUS-TP-CNB and EFB in the diagnosis of complex rectal lesions appears to have been conducted. We retrospectively analyzed the data of 32 consecutive patients with complex rectal lesions, who underwent EFB followed by TRCEUS-TP-CNB, to explore the application value of the TRCEUS-TP-CNB technique in complex rectal lesions. We present this article in accordance with the STROBE reporting checklist (available at https://qims.amegroups.com/article/view/10.21037/qims-23-1451/rc).

Methods

Patients

To be eligible for inclusion in this study, the patients had to meet the following inclusion criteria: (I) have undergone transrectal ultrasound and endoscopy that could display lesions, and have no contraindications for biopsy; (II) have undergone EFB followed by TRCEUS-TP-CNB before a clear diagnosis was made; (III) have complete clinical, endoscopic, and ultrasonic data; and (IV) have surgical resection pathologic results or follow-up results, and have received a clear diagnosis. Patients were excluded from the study if they met any of the following exclusion criteria: (I) had lesions located in a high position or intestinal stenosis, resulting in lesions that could not be detected by transrectal ultrasound; (II) had an increased risk of bleeding and infection after biopsy; and/or (III) had incomplete EFB or TRCEUS-TP-CNB data.

The data of 32 consecutive patients with complex rectal lesions admitted to our hospital from May 2016 to June 2022 were retrospectively analyzed (*Figure 1*). In these patients, the final diagnosis was not confirmed by pathologic findings of EFB, and TRCEUS-TP-CNB was recommended by a subsequent multiple disciplinary treatment team. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Biomedical Research Ethics Committee of West China Hospital of Sichuan University (No. 2021-976). Patients signed an informed consent form prior to biopsy and surgery.

Definition of final diagnosis and successful sampling

In this study, a final diagnosis refers to a pathological diagnosis of surgically excised specimens, or a final clinical diagnosis before chemoradiotherapy, or a diagnosis after follow-up. Successful sampling was defined as the ability to make clinical treatment decisions based on the results of the sampling.

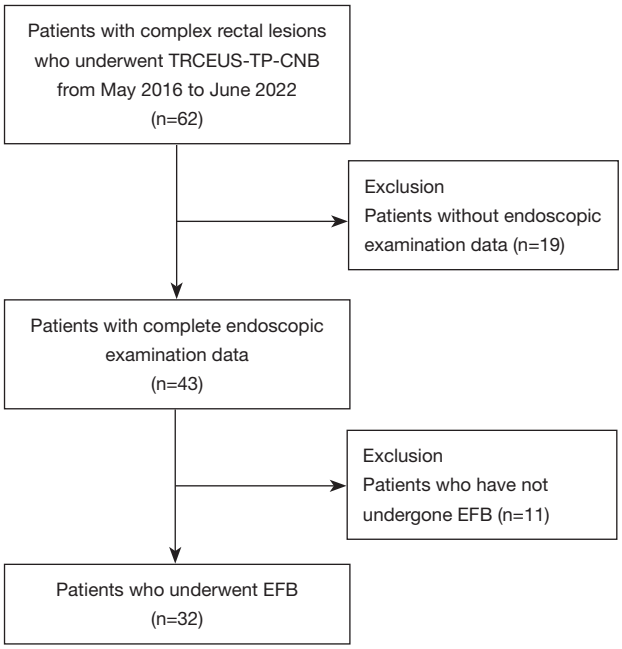

Figure 1 Flowchart displaying the number of patients enrolled in the study. TRCEUS-TP-CNB, transrectal contrast-enhanced ultrasound-guided transperineal core-needle biopsy; EFB, endoscopic forceps biopsy.

Instruments and methods

EFB

Routine blood tests, coagulation tests, and examination for infectious diseases were performed prior to the biopsy. After a routine cleaning enema, micro-tech endoscopy CBF-23/1800-A biopsy forceps (Nanjing, China) were used for the EFB of the rectal lesions. The location and shape of the lesions, and the depth of the lesions from the anal margin were recorded, and the EFB of the lesions was performed under endoscopy. According to the previous EFB pathological results, arrangements were made as to whether samples needed to be taken again when the patients returned to hospital as appropriate. The times of samples taken varied from 1 to 4 times among different patients. Depending on the quality of the gross specimen and patient tolerance, the number of specimens per sample varied from 1 to 8, each with a diameter of 0.2 to 0.3 cm, but the whole lesion was not removed. In this article, the EFB pathological results of the 32 patients were not confirmed before resection or follow-up.

TRCEUS-TP-CNB

To further clarify the diagnosis, these patients underwent TRCEUS-TP-CNB after a multiple disciplinary treatment team discussion. As the doctor in the multiple disciplinary treatment team and the doctor performing the TRCEUS-TP-CNB procedure were not the same person, the doctor performing the TRCEUS-TP-CNB procedure was not aware of the patient's clinical information and EFB results. After emptying the stool, the patient was examined in the left lateral decubitus position with hip flexion or lithotomy position, according to the location of the mass, the insertion point of the needle, and the operating space required for puncture. The MyLab Twice ultrasound system (Esaote, Genoa, Italy) equipped with a bi-planar intracavity probe (TRT33, linear array frequency 4–13 MHz, convex array frequency 3–9 MHz) was used for the transrectal ultrasound. The location, length, width, thickness, ultrasonic features, and depth of the lesion from the anal margin, and scope of the involved intestinal circumference were recorded. Transrectal CEUS was then performed to record the degree of enhancement, the pattern of enhancement, and the liquefied necrotic area of the lesion.

Next, the probe was switched to the linear array mode, in which the transperineal biopsy of the tumor enhancement area was monitored in real time by transrectal ultrasound. A freehand biopsy of the lesion was performed (30,32). First, a coaxial needle was inserted from the perineal skin into the edge of the mass and left there. Next, the needle sheath was fixed and the needle core was withdrawn. A matching puncture needle (MG1522 BARD MAGNUM Biopsy Instrument; Tempe, AZ, United States; disposable core tissue biopsy needle; gauge size: 16 G; needle length: 16 cm) was inserted along the needle sheath to ensure that there was only one needle path during multiple sampling processes. By adjusting the angle and direction of the puncture needle, we ensured that the tissue strips were sampled multiple times from different parts of the target. The sample length of the Biopsy Instrument was set to 1.5 or 2.2 cm, depending on the size of the lesion. Based on the quality of the gross specimen and the patient's tolerance, the number of specimens per sample varied from 5 to 12.

Statistical analysis

SPSS Statistics software (version 19.0; IBM Corporation,

Table 1 Clinical, endoscopic, and ultrasonic characteristics of the 32 patients

Characteristic	Value
Gender, n (%)	
Male	17 (53.13)
Female	15 (46.87)
Manifestations, n (%)	
No symptom	6 (18.75)
Constipation	1 (3.13)
Bloody stool	12 (37.50)
Change in stool habits	2 (6.25)
Dyschezia	3 (9.37)
Diarrhea	2 (6.25)
Anal distension with changes in stool habits	5 (15.62)
Perianal nodule	1 (3.13)
*Final diagnosis, n (%)	
Surgical resection patients	17 (53.12)
Inflammatory follow-up patients	6 (18.75)
Patients with advanced tumor chemoradiotherapy	7 (21.87)
Lymphoma chemotherapy patient	1 (3.13)
Patients who chose chemotherapy due to complications	1 (3.13)
Endoscopic finding, n (%)	
Neoplasm	16 (50.00)
Ulcer	6 (18.75)
Subepithelial lesions	10 (31.25)
Location, n (%)	
Anterior wall	6 (18.75)
Posterior wall	5 (15.62)
Left wall	11 (34.38)
Right wall	10 (31.25)
Boundary, n (%)	
Clear	9 (28.13)
Unclear	23 (71.87)
Shape, n (%)	
Regular	7 (21.87)
Irregular	25 (78.13)
RI, n (%)	
≥0.75	22 (68.75)
<0.75	10 (31.25)
Enhancement degree, n (%)	
Hyperenhancement	20 (62.50)
Hypoenhancement	12 (37.50)
Enhancement pattern, n (%)	
Homogeneous	14 (43.75)
Inhomogenous (unenhancement area ≥50%)	8 (25.00)
Inhomogenous (unenhancement area <50%)	10 (31.25)

*, final diagnosis: refers to the pathological diagnosis of surgically excised specimens or the final clinical diagnosis before chemoradiotherapy or the diagnosis after follow-up. RI, resistance index.

Armonk, NY, USA) was used for the statistical analysis of the data. The normally distributed measurement data are expressed as the mean ± standard deviation. The inter-group and intra-group comparisons of the success rates of TRCEUS-TP-CNB and EFB were performed using the two-independent sample *t*-test or the single-sample *t*-test as appropriate. The counting data are represented as the number of cases (n) and percentage (%), and the Chi-square test of the corrected paired four-cell table was used for comparisons between groups. A two-tailed $P<0.05$ was considered statistically significant.

Results

A total of 32 patients (17 males and 15 females) with complex rectal lesions underwent EFB followed by TRUS-TP-CNB (*Figure 1*). The mean age of the patients was 53.56±17.06 years (range, 22–86 years). *Table 1* summarizes the clinical, endoscopic, and ultrasonic characteristics of 32 patients. Among the patients, 6 were asymptomatic (the lesion was discovered by accident or on physical examination) and 26 were symptomatic. Among the 7 inflammatory patients, 1 patient was confirmed by surgery to have the human papilloma virus infection, while the lesions in the other 6 patients shrank or disappeared after 1–3 years of follow-up and were ultimately diagnosed as

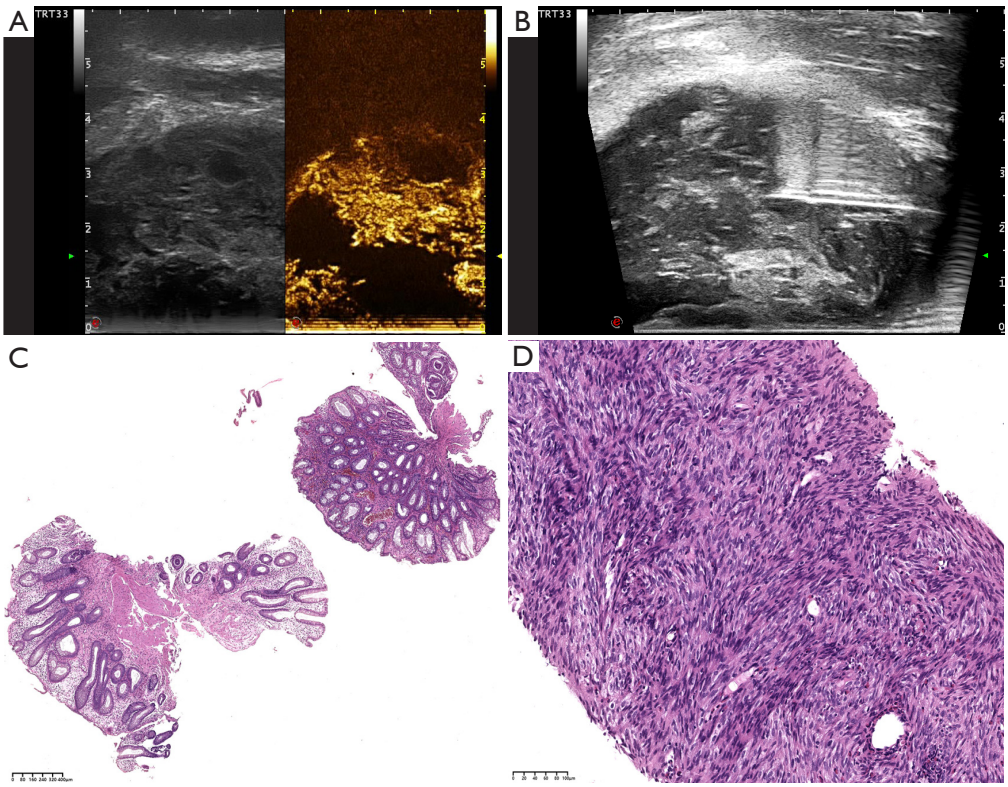

Figure 2 Ultrasound manifestations and pathological results of rectal GIST with extensive necrosis. (A) Transrectal CEUS: a large area of no enhancement can be observed near the rectal wall in the mass. (B) TRCEUS-TP-CNB: under the guidance of CEUS, the puncture needle was inserted into the enhanced area of the mass for biopsy. (C) The pathological result of endoscopic forceps biopsy: inflammation (H&E stain, ×40 magnification). (D) The pathological result of TRCEUS-TP-CNB: GIST (H&E stain, ×200 magnification). Diagnosis after resection of the mass: GIST. GIST, gastrointestinal stromal tumor; CEUS, contrast-enhanced ultrasound; TRCEUS-TP-CNB, transrectal contrast-enhanced ultrasound-guided transperineal core-needle biopsy; H, hematoxylin; E, eosin.

inflammatory lesions.

Among the 10 cases of SELs, there were 5 cases of gastrointestinal stromal tumors (*Figure 2*), 1 case of an inflammatory lesion, 1 case of endometriosis, 1 case of non-Hodgkin lymphoma, 1 case of sarcoma (*Figure 3*), and 1 case of a histiocytic proliferative lesion. The sampling success rate of EFB was 10% (1/10) and that of TRCEUS-TP-CNB was 100% (10/10). Paired studies between the two groups showed statistically significant differences (P=0.004).

According to the final diagnosis classification, the sampling results of TRCEUS-TP-CNB and EFB are shown in *Table 2*. EFB was used in 6 cases of gastrointestinal stromal tumors, 5 cases of inflammatory lesions (*Figure 2C*), and 1 case of a mesenchymal tumor, and the success rate of sampling was 0 (0/6). However, the sampling success rate of TRCEUS-TP-CNB was 100% (6/6), and the paired study of the two methods showed a statistically significant difference (P=0.031). Among the 11 adenocarcinoma patients, the sampling success rate of EFB was 0 (0/11), and that of TRCEUS-TP-CNB was 90.91% (10/11), and the difference was statistically significant (P=0.002).

We analyzed the factors affecting the sampling success rate of TRCEUS-TP-CNB and EFB in complex rectal lesions. The intra- and inter-group comparison results for TRCEUS-TP-CNB and EFB are shown in *Table 3*. In the EFB group, the times of samples per person for the 32 patients was 1.81±1.06, and the number of specimens per sample for the 32 patients was 3.11±1.30; 7 patients were successfully sampled, with a success rate of 21.88% (7/32). In the TRCEUS-TP-CNB group, the times of samples per person for the 32 patients was 1, and the number of specimens per sample for the 32 patients was 8.19±1.91; 30 patients were successfully sampled, with a success rate of 93.75% (30/32). No complications were observed for either

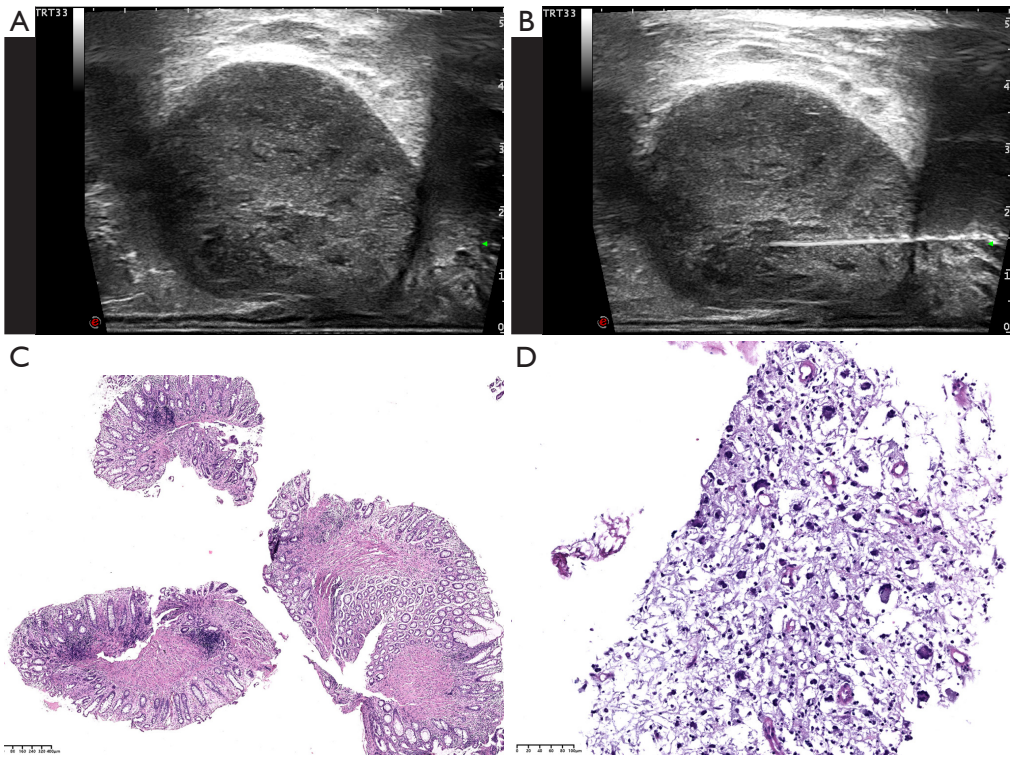

Figure 3 Ultrasound manifestations and pathological results of rectal subepithelial lesion. (A) Transrectal ultrasound: the mass was located in the submucosa of the rectum. (B) TRCEUS-TP-CNB of the mass. (C) The pathological result of endoscopic forceps biopsy: inflammation with lymphoid hyperplasia (H&E stain, ×40 magnification). (D) The pathological result of TRCEUS-TP-CNB: sarcoma (H&E stain, ×200 magnification). The patient was treated with drugs due to coronary heart disease and its complications. Final clinical diagnosis: sarcoma. TRCEUS-TP-CNB, transrectal contrast-enhanced ultrasound-guided transperineal core-needle biopsy; H, hematoxylin; E, eosin.

biopsy method.

Based on the above results, it may be possible to provide a reference algorithm to choose EFB or TRCEUS-TP-CNB as the optimal technique for the biopsy of complex rectal lesions. TRCEUS-TP-CNB is more suitable for larger rectal lesions and SELs, which is an important supplement to the first-line diagnostic tool EFB (*Figure 4*).

Discussion

EFB is a first-line method used to obtain specimens of diseased rectal tissue (7). In this study, the sampling success rate of EFB for complex rectal lesions was 21.88% (7/32), which is consistent with that reported in the literature (7). The EFB technique plays an important role in the diagnosis of rectal lesions; however, the EFB pathological results of 32 patients with complex rectal lesions in this study could not be definitively diagnosed before follow-up. To meet clinical diagnosis and treatment needs, these patients underwent TRCEUS-TP-CNB after multiple disciplinary treatment team discussion, and the sampling success rate was 93.75% (30/32), which was significantly higher than that of EFB (21.88%, 7/32). The factors contributing to the difference in the sampling success rates between the two biopsy techniques have not been reported in the literature. Through a retrospective analysis, we conducted the first intra- and inter-group comparative study of TRCEUS-TP-CNB and EFB to explore the factors affecting the sampling success rates of the two biopsy methods.

As *Table 3* shows, in the analysis of the factors affecting the sampling success rate, the times of samples per person and the number of specimens per sample were not factors affecting TRCEUS-TP-CNB or EFB, but there were statistically significant differences between TRCEUS-TP-CNB and EFB (P=0.015 and <0.001). In the successful sampling EFB group, the times of samples per person was 2.14±0.90, and the number of specimens per sample was 3.31±1.67. In the successful sampling TRCEUS-TP-

Table 2 Comparison of TRCEUS-TP-CNB and EFB sampling results in 32 patients classified by final diagnosis

*Final diagnosis [n]	EFB		TRCEUS-TP-CNB	
	Sampling result	Number	Sampling result	Number
GIST [6]	Inflammatory lesion	5	GIST	6
	Mesenchymal tumor	1		
Adenocarcinoma [11]	Adenoma	6	Adenocarcinoma	10
	Inflammatory lesion	3	Adenoma	1
	Lymphocyte infiltration	1		
	Proliferative polyp	1		
Inflammatory lesion [7]	Inflammatory lesion	7	Inflammatory lesion	7
Endometriosis [2]	Inflammatory lesion	1	Endometriosis	2
	Proliferative polyp	1		
Neuroendocrine neoplasm [2]	Adenoma with malignant change	1	Neuroendocrine neoplasm	1
	Tumor, difficulty in further classification	1	Tumor, difficulty in further classification	1
Squamous carcinoma [1]	Inflammatory lesion	1	Squamous carcinoma	1
Non-Hodgkin lymphoma [1]	Inflammatory with atypical lymphoid hyperplasia	1	Non-Hodgkin lymphoma	1
Sarcoma [1]	Inflammation with lymphoid hyperplasia	1	Sarcoma	1
Histiocytic proliferative lesion [1]	Inflammatory lesion	1	Histiocytic proliferative lesion	1

*, final diagnosis: refers to the pathological diagnosis of surgically excised specimens or the final clinical diagnosis before chemoradiotherapy or the diagnosis after follow-up. EFB, endoscopic forceps biopsy; TRCEUS-TP-CNB, transrectal contrast-enhanced ultrasound-guided transperineal core-needle biopsy; GIST, gastrointestinal stromal tumor.

Table 3 Factors influencing the success rate of TRCEUS-TP-CNB and EFB: intra- and inter-group comparisons

Variable	EFB (n=32)			TRCEUS-TP-CNB (n=32)			P value (TRCEUS-TP-CNB *vs.* EFB)
	#Successful sampling	Unsuccessful sampling	P value	#Successful sampling	Unsuccessful sampling	P value	
No. of samples	7 (21.88)	25 (78.12)	–	30 (93.75)	2 (6.25)	–	<0.001
Times of samples per person	2.14 (0.90)	1.72 (1.10)	0.36	1	1	–	0.015
No. of specimens per sample	3.31 (1.67)	3.06 (1.21)	0.66	8.27 (1.93)	7 (1.41)	0.37	<0.001
Age (years)	52.43 (15.87)	53.88 (17.68)	0.85	54.50 (16.86)	39.50 (19.09)	0.24	0.77
Circumference of infiltrated rectal wall	36% (18%)	44% (19%)	0.34	42% (18%)	46% (41%)	0.77	0.44
Length (cm)	3.07 (1.27)	5.36 (2.93)	0.06	4.84 (2.88)	5.15 (1.91)	0.88	0.12
Width (cm)	1.90 (0.62)	4.26 (2.40)	<0.001	3.79 (2.42)	3.05 (0.64)	0.67	0.001
Thickness (cm)	1.29 (0.51)	2.96 (1.75)	<0.001	2.64 (1.75)	1.90 (0.42)	0.56	0.001
Depth (cm)	3.31 (1.76)	2.81 (1.86)	0.53	2.94 (1.87)	2.65 (1.20)	0.83	0.63

Data are presented as n (%) or mean (standard deviation); #, successful sampling: the ability to make clinical treatment decisions based on the results of the sampling. TRCEUS-TP-CNB, transrectal contrast-enhanced ultrasound-guided transperineal core-needle biopsy; EFB, endoscopic forceps biopsy.

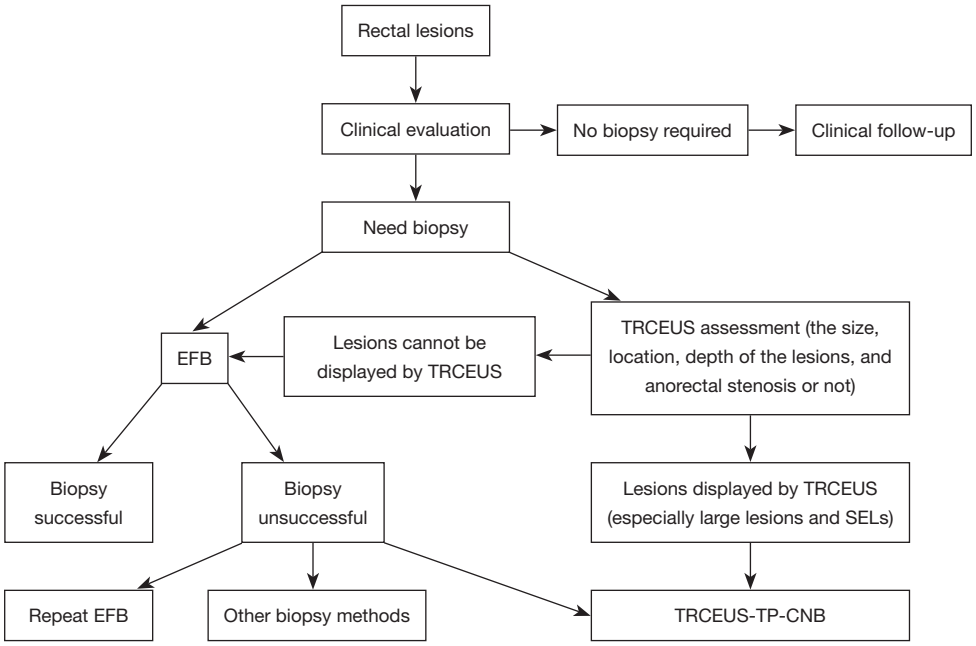

Figure 4 Suggested algorithm for selecting biopsy methods for complex rectal lesions. EFB, endoscopic forceps biopsy; TRCEUS, transrectal contrast-enhanced ultrasound; TRCEUS-TP-CNB, transrectal contrast-enhanced ultrasound-guided transperineal core-needle biopsy; SELs, subepithelial lesions.

CNB group, the times of samples per person was 1, and the number of specimens per sample was 8.27±1.93. The sampling success rate of TRCEUS-TP-CNB was much higher than that of EFB (93.75% *vs.* 21.88%). Therefore, patients who underwent EFB experienced multiple biopsies, suffered more pain, and psychological pressure, but gained less benefit (successful sampling). Compared with the EFB, the TRCEUS-TP-CNB was performed freehand (30,32) and coaxial needle technology was used (36). There was only one puncture channel in the whole sampling process. By adjusting the angle and direction of the puncture needle, the multiple and multi-point sampling of lesions could be completed (37). Therefore, TRCEUS-TP-CNB not only ensures a higher sampling success rate, but also reduces the patient's pain, as well as the risk of bleeding and needle path implantation metastasis.

The factors affecting the EFB success rate included the width (P<0.001) and thickness (P<0.001) (i.e., the size of the rectal lesions), such that the larger lesions had a lower success rate. Conversely, the TRCEUS-TP-CNB success rate was not affected by the size of the lesion. In the paired study of TRCEUS-TP-CNB and EFB, the lesion width (P=0.001) and lesion thickness (P=0.001) were also identified as factors affecting the difference in the sampling success rate (*Table 3*). Larger lesions had a higher success rate in TRCEUS-TP-CNB, but a lower success rate was observed in EFB. This may be because necrotic liquefaction is more likely to occur in larger tumors (38), especially when the necrotic liquefaction area of the tumor is located near the rectal wall (*Figure 2A*), and the specimens obtained by EFB may include some necrotic or inflammatory tissues (*Figure 2C*), thus affecting the quality of the EFB specimens. In addition, greater internal heterogeneity is more likely to occur in larger tumors (35,39-42), and EFB sampling locations are usually limited to the side near the rectal wall. Therefore, the EFB sampling success rate is likely to be lower in larger tumors (43,44). However, CEUS can clearly show enhanced areas of non-liquefied necrosis in the tumors (35,45,46). Under the guidance of CEUS, TRCEUS-TP-CNB can be used to freely select the puncture site for the enhanced area of the tumor (*Figure 2B*). Thus, the sampling success rates of TRCEUS-TP-CNB are not affected by necrotic liquefaction in the tumors. Meanwhile, due to the wider sampling range, the samples are less affected by the heterogeneity of the tumor, ensuring a higher sampling success rate of TRCEUS-TP-CNB.

In this study, the sampling success rate of EFB for SELs was 10% (1/10). Some suggestions have been made in the

literature (1,11,14,17) as to how to improve the sampling success rate of SELs, such as fine-needle biopsy technology guided by endoscopic ultrasound (12). For SELs less than 1cm, some advanced endoscopic resection techniques, such as endoscopic resection and endoscopic sub-mucosal dissection, can not only provide accurate pathological specimens, but can also achieve the goal of cure (43,44). However, these protocols are all transrectal biopsies, and there are significant differences in the sampling success rates reported in different studies (11,14,47), with some risk of serious complications (18,19,22-24). Unlike in a transrectal biopsy, in a TRCEUS-TP-CNB, the puncture needle is inserted through the perineal skin. This technique takes advantage of the high-resolution display of deep pelvic lesions by transrectal ultrasound (33) (*Figure 3A*), and the sampling process is not affected by the epithelial tissue covering the lesion surface (*Figure 3B*). In addition, the perineal injection has fewer complications (28,30,48-50), puncture sites are easy to care for, hemostasis is easy to compress, and intestinal preparation and the preventive use of antibiotics are not required (51), which reduces the occurrence of multiple drug resistance (25,27). In this study, the sampling success rate of TRCEUS-TP-CNB in rectal SELs was 100% (10/10), which was significantly better than that of EFB (10%, 1/10).

This study had some limitations. First, this was a retrospective study. TRCEUS-TP-CNB was only performed because a clear diagnose could not be made by EFB. Therefore, there was a certain selection bias in the cases, and prospective comparative studies need to be conducted. Second, this study had a small sample size. Further multicenter, large sample studies need to be conducted to verify our results.

Conclusions

In conclusion, our study showed that TRCEUS-TP-CNB is a safe biopsy technique in the preoperative diagnosis of complex rectal lesions. TRCEUS-TP-CNB is also an effective biopsy technique, with a higher diagnostic rate, requires fewer times of samples to be taken, and gains more specimens per sampling, and is thus an important supplementary method to the first-line diagnostic tool EFB. TRCEUS-TP-CNB is expected to become one of the preferred methods of examination, especially for large lesions and SELs of the rectum.

Acknowledgments

Funding: This study was funded by the National Natural Science Foundation of China (No. 82001833 to T.Q.).

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://qims.amegroups.com/article/view/10.21037/qims-23-1451/rc

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://qims.amegroups.com/article/view/10.21037/qims-23-1451/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Biomedical Research Ethics Committee of West China Hospital of Sichuan University (No. 2021-976). Participants provided informed consent to participate in the study before taking part in the study.

References

1. Liu M, Lu ZH, Wang QX, Zheng W, Pei XQ, Han F, Zhou JH, Lin X, Wan DS, Li AH. Diagnostic value, safety, and histopathologic discrepancy risk factors for endoscopic forceps biopsy and transrectal ultrasound-guided core needle biopsy in rectum lesions. Ann Transl Med 2019;7:607.
2. Cazacu IM, Singh BS, Luzuriaga Chavez AA, Koduru P,

Ejaz S, Weston BR, Ross WA, Lee JH, Roy-Chowdhuri S, Bhutani MS. EUS and EUS-guided FNA/core biopsies in the evaluation of subepithelial lesions of the lower gastrointestinal tract: 10-year experience. Endosc Ultrasound 2020;9:329-36.
3. Brunaldi VO, Coronel M, Chacon DA, De Moura ET, Matuguma SE, De Moura EG, De Moura DT. Subepithelial rectal gastrointestinal stromal tumor - the use of endoscopic ultrasound-guided fine needle aspiration to establish a definitive cytological diagnosis: a case report. J Med Case Rep 2017;11:59.
4. Casali PG, Abecassis N, Aro HT, Bauer S, Biagini R, Bielack S, et al. Gastrointestinal stromal tumours: ESMO-EURACAN Clinical Practice Guidelines for diagnosis, treatment and follow-up. Ann Oncol 2018;29:iv68-78.
5. de Moura DTH, McCarty TR, Jirapinyo P, Ribeiro IB, Flumignan VK, Najdawai F, Ryou M, Lee LS, Thompson CC. EUS-guided fine-needle biopsy sampling versus FNA in the diagnosis of subepithelial lesions: a large multicenter study. Gastrointest Endosc 2020;92:108-19.e3.
6. Chen W, Zheng R, Baade PD, Zhang S, Zeng H, Bray F, Jemal A, Yu XQ, He J. Cancer statistics in China, 2015. CA Cancer J Clin 2016;66:115-32.
7. Dumonceau JM, Deprez PH, Jenssen C, Iglesias-Garcia J, Larghi A, Vanbiervliet G, Aithal GP, Arcidiacono PG, Bastos P, Carrara S, Czakó L, Fernández-Esparrach G, Fockens P, Ginès À, Havre RF, Hassan C, Vilmann P, van Hooft JE, Polkowski M. Indications, results, and clinical impact of endoscopic ultrasound (EUS)-guided sampling in gastroenterology: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline - Updated January 2017. Endoscopy 2017;49:695-714.
8. Maasberg S, Jürgensen C, Scheerer F, Pschowski R, Felder S, Begum N, Wiedenmann B, Pascher A, Pape UF. Endoscopic therapy for gastroduodenal neuroendocrine neoplasms. Chirurg 2016;87:271-9.
9. Cârțână ET, Gheonea DI, Săftoiu A. Advances in endoscopic ultrasound imaging of colorectal diseases. World J Gastroenterol 2016;22:1756-66.
10. Landi B, Palazzo L. The role of endosonography in submucosal tumours. Best Pract Res Clin Gastroenterol 2009;23:679-701.
11. Zhang XC, Li QL, Yu YF, Yao LQ, Xu MD, Zhang YQ, Zhong YS, Chen WF, Zhou PH. Diagnostic efficacy of endoscopic ultrasound-guided needle sampling for upper gastrointestinal subepithelial lesions: a meta-analysis. Surg Endosc 2016;30:2431-41.
12. Facciorusso A, Bajwa HS, Menon K, Buccino VR, Muscatiello N. Comparison between 22G aspiration and 22G biopsy needles for EUS-guided sampling of pancreatic lesions: A meta-analysis. Endosc Ultrasound 2020;9:167-74.
13. Jenssen C, Hocke M, Fusaroli P, Gilja OH, Buscarini E, Havre RF, Ignee A, Saftoiu A, Vilmann P, Burmester E, Nolsøe CP, Nürnberg D, D'Onofrio M, Lorentzen T, Piscaglia F, Sidhu PS, Dietrich CF. EFSUMB Guidelines on Interventional Ultrasound (INVUS), Part IV - EUS-guided Interventions: General aspects and EUS-guided sampling (Long Version). Ultraschall Med 2016;37:E33-76.
14. Larghi A, Fuccio L, Chiarello G, Attili F, Vanella G, Paliani GB, Napoleone M, Rindi G, Larocca LM, Costamagna G, Ricci R. Fine-needle tissue acquisition from subepithelial lesions using a forward-viewing linear echoendoscope. Endoscopy 2014;46:39-45.
15. Eckardt AJ, Jenssen C. Current endoscopic ultrasound-guided approach to incidental subepithelial lesions: optimal or optional? Ann Gastroenterol 2015;28:160-72.
16. Dumonceau JM, Polkowski M, Larghi A, Vilmann P, Giovannini M, Frossard JL, Heresbach D, Pujol B, Fernández-Esparrach G, Vazquez-Sequeiros E, Ginès A; . Indications, results, and clinical impact of endoscopic ultrasound (EUS)-guided sampling in gastroenterology: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. Endoscopy 2011;43:897-912.
17. Won SY, Kim HS, Park SY. Transrectal or transvaginal ultrasoundguided biopsy for pelvic masses: external validation and usefulness in oncologic patients. Ultrasonography 2019;38:149-55.
18. Loeb S, Vellekoop A, Ahmed HU, Catto J, Emberton M, Nam R, Rosario DJ, Scattoni V, Lotan Y. Systematic review of complications of prostate biopsy. Eur Urol 2013;64:876-92.
19. Enlund AL, Varenhorst E. Morbidity of ultrasound-guided transrectal core biopsy of the prostate without prophylactic antibiotic therapy. A prospective study in 415 cases. Br J Urol 1997;79:777-80.
20. Symons JL, Huo A, Yuen CL, Haynes AM, Matthews J, Sutherland RL, Brenner P, Stricker PD. Outcomes of transperineal template-guided prostate biopsy in 409 patients. BJU Int 2013;112:585-93.
21. Pepe P, Aragona F. Prostate biopsy: results and advantages of the transperineal approach--twenty-year experience of a single center. World J Urol 2014;32:373-7.
22. Carignan A, Roussy JF, Lapointe V, Valiquette L, Sabbagh R, Pépin J. Increasing risk of infectious complications

after transrectal ultrasound-guided prostate biopsies: time to reassess antimicrobial prophylaxis? Eur Urol 2012;62:453-9.
23. Williamson DA, Roberts SA, Paterson DL, Sidjabat H, Silvey A, Masters J, Rice M, Freeman JT. Escherichia coli bloodstream infection after transrectal ultrasound-guided prostate biopsy: implications of fluoroquinolone-resistant sequence type 131 as a major causative pathogen. Clin Infect Dis 2012;54:1406-12.
24. Assimacopoulos A, Johnston B, Clabots C, Johnson JR. Post-prostate biopsy infection with Escherichia coli ST131 leading to epididymo-orchitis and meningitis caused by Gram-negative bacilli. J Clin Microbiol 2012;50:4157-9.
25. Grummet JP, Weerakoon M, Huang S, Lawrentschuk N, Frydenberg M, Moon DA, O'Reilly M, Murphy D. Sepsis and 'superbugs': should we favour the transperineal over the transrectal approach for prostate biopsy? BJU Int 2014;114:384-8.
26. Nordström T, Adolfsson J, Grönberg H, Eklund M. Repeat Prostate-Specific Antigen Tests Before Prostate Biopsy Decisions. J Natl Cancer Inst 2016;108:djw165.
27. Williamson DA, Barrett LK, Rogers BA, Freeman JT, Hadway P, Paterson DL. Infectious complications following transrectal ultrasound-guided prostate biopsy: new challenges in the era of multidrug-resistant Escherichia coli. Clin Infect Dis 2013;57:267-74.
28. Xiang J, Yan H, Li J, Wang X, Chen H, Zheng X. Transperineal versus transrectal prostate biopsy in the diagnosis of prostate cancer: a systematic review and meta-analysis. World J Surg Oncol 2019;17:31.
29. Meyer AR, Joice GA, Schwen ZR, Partin AW, Allaf ME, Gorin MA. Initial Experience Performing In-office Ultrasound-guided Transperineal Prostate Biopsy Under Local Anesthesia Using the PrecisionPoint Transperineal Access System. Urology 2018;115:8-13.
30. Ristau BT, Allaway M, Cendo D, Hart J, Riley J, Parousis V, Albertsen PC. Free-hand transperineal prostate biopsy provides acceptable cancer detection and minimizes risk of infection: evolving experience with a 10-sector template. Urol Oncol 2018;36:528.e15-20.
31. Stefanova V, Buckley R, Flax S, Spevack L, Hajek D, Tunis A, Lai E, Loblaw A; . Transperineal Prostate Biopsies Using Local Anesthesia: Experience with 1,287 Patients. Prostate Cancer Detection Rate, Complications and Patient Tolerability. J Urol 2019;201:1121-6.
32. Marra G, Marquis A, Tappero S, D'Agate D, Oderda M, Calleris G, Falcone M, Faletti R, Molinaro L, Zitella A, Bergamasco L, Gontero P. Transperineal Free-hand mpMRI Fusion-targeted Biopsies Under Local Anesthesia: Technique and Feasibility From a Single-center Prospective Study. Urology 2020;140:122-31.
33. Nuernberg D, Saftoiu A, Barreiros AP, Burmester E, Ivan ET, Clevert DA, Dietrich CF, Gilja OH, Lorentzen T, Maconi G, Mihmanli I, Nolsoe CP, Pfeffer F, Rafaelsen SR, Sparchez Z, Vilmann P, Waage JER. EFSUMB Recommendations for Gastrointestinal Ultrasound Part 3: Endorectal, Endoanal and Perineal Ultrasound. Ultrasound Int Open 2019;5:E34-51.
34. Zhang Q, Zhao JY, Zhuang H, Lu CY, Yao J, Luo Y, Yu YY. Transperineal core-needle biopsy of a rectal subepithelial lesion guided by endorectal ultrasound after contrast-enhanced ultrasound: A case report. World J Gastroenterol 2021;27:1354-61.
35. Sparchez Z, Radu P, Kacso G, Eniu D, Hica S, Sparchez M. Contrast-enhanced ultrasound guided biopsy of superficial toraco-abdominal and neck lesions. Initial experience in 20 patients. Med Ultrason 2012;14:288-93.
36. Pedote P, Gaudio F, Moschetta M, Cimmino A, Specchia G, Angelelli G. CT-guided needle biopsy performed with modified coaxial technique in the diagnosis of malignant lymphomas. Radiol Med 2010;115:1292-303.
37. He Y, Ji X, Xie Y, He B, Xu X, Chen X, Zhang Q. Clinical application of ultrasound-guided core needle biopsy with multiple punches in the diagnosis of lymphoma. World J Surg Oncol 2015;13:126.
38. Burkill GJ, Badran M, Al-Muderis O, Meirion Thomas J, Judson IR, Fisher C, Moskovic EC. Malignant gastrointestinal stromal tumor: distribution, imaging features, and pattern of metastatic spread. Radiology 2003;226:527-32.
39. Aarons CB, Shanmugan S, Bleier JI. Management of malignant colon polyps: current status and controversies. World J Gastroenterol 2014;20:16178-83.
40. MacDonald AW, Tayyab M, Arsalani-Zadeh R, Hartley JE, Monson JR. Intramucosal carcinoma on biopsy reliably predicts invasive colorectal cancer. Ann Surg Oncol 2009;16:3267-70.
41. Shussman N, Wexner SD. Colorectal polyps and polyposis syndromes. Gastroenterol Rep (Oxf) 2014;2:1-15.
42. Bujanda L, Cosme A, Gil I, Arenas-Mirave JI. Malignant colorectal polyps. World J Gastroenterol 2010;16:3103-11.
43. Xu G, Zhang W, Lv Y, Zhang B, Sun Q, Ling T, Zhang X, Zhou Z, Wang L, Huang Q, Zou X. Risk factors for under-diagnosis of gastric intraepithelial neoplasia and early gastric carcinoma in endoscopic forceps biopsy in comparison with endoscopic submucosal dissection in

Chinese patients. Surg Endosc 2016;30:2716-22.
44. Ryu DG, Choi CW, Kang DH, Kim HW, Park SB, Kim SJ, Nam HS. Clinical outcomes of endoscopic submucosa dissection for high-grade dysplasia from endoscopic forceps biopsy. Gastric Cancer 2017;20:671-8.
45. Skelton E, Jewison A, Okpaluba C, Sallomi J, Lowe J, Ramesar K, Grace R, Howlett DC. Image-guided core needle biopsy in the diagnosis of malignant lymphoma. Eur J Surg Oncol 2015;41:852-8.
46. Yamashita Y, Kato J, Ueda K, Nakamura Y, Abe H, Tamura T, Itonaga M, Yoshida T, Maeda H, Moribata K, Niwa T, Maekita T, Iguchi M, Tamai H, Ichinose M. Contrast-enhanced endoscopic ultrasonography can predict a higher malignant potential of gastrointestinal stromal tumors by visualizing large newly formed vessels. J Clin Ultrasound 2015;43:89-97.
47. Pih GY, Kim DH. Endoscopic Ultrasound-Guided Fine Needle Aspiration and Biopsy in Gastrointestinal Subepithelial Tumors. Clin Endosc 2019;52:314-20.
48. Loy LM, Lim GH, Leow JJ, Lee CH, Tan TW, Tan CH. A systematic review and meta-analysis of magnetic resonance imaging and ultrasound guided fusion biopsy of prostate for cancer detection-Comparing transrectal with transperineal approaches. Urol Oncol 2020;38:650-60.
49. Sağlam M, Uğurel S, Kilciler M, Taşar M, Somuncu I, Uçöz T. Transrectal ultrasound-guided transperineal and transrectal management of seminal vesicle abscesses. Eur J Radiol 2004;52:329-34.
50. Bhanji Y, Allaway MJ, Gorin MA. Recent Advances and Current Role of Transperineal Prostate Biopsy. Urol Clin North Am 2021;48:25-33.
51. Borghesi M, Ahmed H, Nam R, Schaeffer E, Schiavina R, Taneja S, Weidner W, Loeb S. Complications After Systematic, Random, and Image-guided Prostate Biopsy. Eur Urol 2017;71:353-65.

Cite this article as: Zhang Q, Qiu T, Zhuang H, Ren Y, Ling W, Luo Y. Transrectal contrast-enhanced ultrasound-guided transperineal core-needle biopsy versus endoscopic forceps biopsy in the diagnosis of complex rectal lesions. Quant Imaging Med Surg 2024;14(4):2762-2773. doi: 10.21037/qims-23-1451

