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Research Article

Endo-ultrasound Versus Conventional Image Guided (CT/US) Fine Needle Aspiration in Diagnosis of Pancreatic Malignancy

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Abstract

Background: The advent of endo-ultrasound (EUS) has demonstrated its effectiveness as a valuable tool for identifying and staging pancreatic lesions with a minimal risk of complications. A debate has arisen regarding the optimal approach for obtaining cells from suspicious masses, with some questioning whether the conventional imaging techniques (CT/US) guided fine-needle aspiration (FNA) or EUS-guided FNA should be favored.

Objectives: To compare the diagnostic accuracy of endoscopic ultrasound-guided fine-needle aspiration (EUS FNA) with that of conventional image-guided fine-needle aspiration (CT/US FNA) for detecting pancreatic malignancies.

Methodology: The study encompassed 28 individuals who were clinically suspected to have pancreatic malignancies. Each patient underwent a conventional fine needle aspiration guided by imaging or an endo-ultrasound-guided fine needle aspiration to diagnose pancreatic malignancy. The collected data were subjected to statistical analysis using SPSS version 23. Statistical methods employed in the analysis included the student t-test and the Chi-square ($\chi 2$) test. A significance level of $p<0.05$ was used to determine statistical significance.

Results: The ability to accurately diagnose cytopathology differed between the two groups: one group underwent conventional image-guided fine-needle aspiration (FNA) with a diagnostic accuracy of 57.1%. In contrast, the other group had an endoscopic ultrasound (EUS) guided FNA with a higher accuracy of 85.7%. Although the numerical difference in accuracy was noteworthy and favored the EUS-guided method, it did not reach statistical significance. Similarly, when focusing solely on the diagnosis of malignancy, the accuracy rates were 35.7% for the CT/US-guided FNA group and 64.3% for the EUS-guided FNA group. However, this difference also lacked statistical significance.

Conclusion: Regarding numerical results, EUS-guided FNA (Endoscopic Ultrasound-Guided Fine-Needle Aspiration) demonstrated higher precision when identifying pancreatic malignancies. This increased precision also improves accuracy in obtaining a sufficient tissue sample for cytological examination and subsequent analysis.

Keywords: Endo-ultrasound; Fine Needle Aspiration; Pancreatic Malignancy; Cytology

Introduction

Endo-ultrasound demonstrates remarkable precision in diagnosing pancreatic malignancies. Recent meta-analyses have revealed a combined sensitivity of 85.0% and 89% for detecting pancreatic malignancies through cytology and corresponding pooled specificities of 98% and 99% [1]. The introduction of endo-ultrasound (EUS) has solidified its reputation as an exceptional approach for detecting and staging pancreatic lesions, all while maintaining a minimal complication rate (<2%) [2,3], which is no higher than that of upper-GI endoscopy. Retrospective studies have demonstrated that EUS-guided fine needle aspiration (FNA) of the pancreas is on par with conventional imaging techniques (CT/US)-guided FNA and even surgical procedures in terms of tissue yield [4,5]. EUS provides the advantage of real-time imaging during FNA procedures for sampling pancreatic lesions, offering direct visualization [6,7]. Its feasibility ranges from 90% to 98%, with an efficiency of collecting analyzable cytological specimens varying from 80% to 95%. In diagnosing pancreatic adenocarcinomas, EUS-guided FNA exhibits sensitivity ranging from 75% to 90%, specificity from 82% to 100%, and a mean accuracy of 85% [3,8].

Initial comparisons between cytology results from conventional imaging-guided FNA and EUS-guided FNA against final histology from surgical pathology have shown that the sensitivity of conventional imaging-guided FNA was 62%. In contrast, EUS-guided FNA demonstrated a sensitivity of 84%. The diagnostic accuracy rates were 72% for conventional imaging-guided FNA and 89% for EUS-guided FNA, respectively [9]. Concerns regarding needle tract seeding with conventional imaging-guided FNA have led to a preference for EUS-guided FNA as the preferred sampling technique in pancreatic masses. Establishing EUS with aspiration needles significantly aids in accurately identifying the lesion, aspirating it for cytological diagnosis, and staging it in cases of pancreatic malignancy. This study compared these two modalities for preoperative cytological diagnosis in clinically suspected pancreatic malignancies. It evaluated them based on tissue acquisition adequacy, diagnostic accuracy, and procedure-related complication rates. Such insights assist clinicians in choosing the most suitable, feasible, and accurate method for their patients.

Methodology

This comparative cross-sectional study was conducted at the Department of General Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka, Bangladesh. The study duration was one year, from April 2019 to March 2020. The study included a total of 28 patients who were suspected of having pancreatic malignancy based on prior clinical assessments, abdominal Ultrasound, or Computed Tomography performed in the Department of Surgery at BSMMU. Patients requiring pancreatic tissue diagnosis were eligible for participation in the study. Each enrolled patient underwent either conventional image-guided (CT/US) fine needle aspiration or endo-ultrasound-guided fine needle aspiration of the pancreatic mass.

Results

Table 1 presents data on the mean age in two groups: the conventional image (CT/US) guided FNA group (n = 14) had a mean age of 51.00 ± 6.94, while the EUS-guided FNA group (n = 14) had a mean age of 46.86 ± 15.52. The male-to-female ratio in the conventional image (CT/US) guided FNA group (n = 14) was 9:5, while in the EUS-guided FNA group (n = 14), it was 8:6. There were no statistically significant differences in age or sex distribution between the two procedures (p > 0.05).

Table 1: Distribution of the patients according to socio-demographic variable (N = 28).

Socio-demographic variables	Procedure		p value
	CT/US (n = 14)	EUS (n = 14)	
Age (mean ± SD)	51.0 ± 6.9	46.9 ± 15.5	0.374
Male	9(64.3)	8(57.1)	0.699
Female	5(35.7)	6(42.9)	

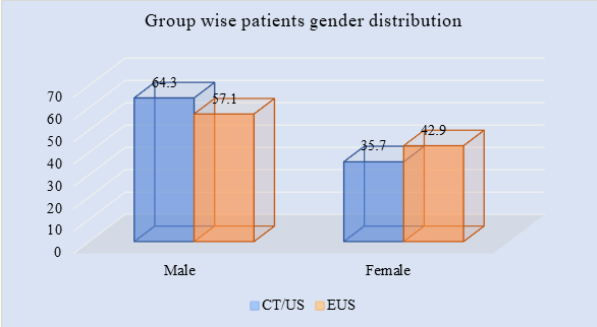

Figure 1: Colum chart showed group wise gender distribution (N = 28).

Table 2: Distribution of the patients according to Pre-procedure radiology and imaging: CT/US and EUS by sample collection procedure (N = 28).

Pre-procedure radiology and imaging: CT/US and EUS	Procedure		p value
	CT/US (n = 14)	EUS (n = 14)	
Size of mass			
2-2.5	11(78.6)	8(57.1)	
2.5-3	1(7.1)	1(7.1)	
3-3.5	2(14.3)	5(35.7)	
Mean ± SD	2.40 ± 0.39	2.69 ± 0.59	0.135
Location			
Head	14(100.0)	12(85.7)	0.481
Body	0(0.0)	2(14.3)	

Table 2 presents data on the average mass size and its location within the pancreas. In the group that underwent conventional image-guided FNA (CT/US) with a sample size 14, the mean mass size was 2.40 cm ± 0.39. Conversely, in the EUS-guided FNA group, also consisting of 14 participants, the mean mass size was measured at 2.69 cm ± 0.59. The p-value associated with these findings is 0.135.

Table 3: Comparison of mean CDE among different grade of cataract in same group.

Parameter	NS2	NS3	NS4	P value*
	MeanSD	MeanSD	MeanSD	
Group 1	5.471.19	9.314 1.25	16.5611.86	<0.001
Group 2	5.172 1.19	8.886 1.406	16.352.05	

*Ordinary one way ANNOVA.

Table 3 presents the FNA outcomes for the comparative groups. In the conventional image (CT/US) guided FNA group (n = 14), 8 out of 14 patients (57.1%) yielded adequate cells for diagnosis. In contrast, the EUS-guided FNA group (n = 14) had 12 patients (85.7%) with adequate cells. The p-value associated with this comparison is 0.209. For the category of inadequate cells for diagnosis, 5 out of 14 patients (35.7%) in the conventional image (CT/US) guided FNA group (n = 14) fell into this group. In contrast, the EUS-guided FNA group (n = 14) had 0 patients (0.0%) with inadequate cells. The p-value for this comparison is 0.041. In the category of having no pancreatic cells at all for diagnosis, 1 out of 14 patients (7.1%) in the conventional image (CT/US) guided FNA group (n = 14) had this outcome. In contrast, the EUS-guided FNA group (n = 14) had two patients (14.3%) with no pancreatic cells. The p-value for this comparison is 0.999.

Table 4: Visual acuity in LogMAR in group 1 and 2 on postoperative days.

LogMAR	Group 1	Group 2	P value
POD7	0.160.1	0.150.11	0.58
POD30	0.120.07	0.130.09	0.52
POD 60	0.100.06	0.090.05	0.34
POD 90	0.080.04	0.070.04	0.19

In the conventional image (CT/US) guided FNA group (n = 14), 5 out of 14 patients (35.7%) were diagnosed with malignancy, while in the EUS guided FNA group (n = 14), this percentage was higher at 9 (64.3%). The p-value for this comparison is 0.131. For patients diagnosed with no malignancy, 3 out of 14 (21.4%) were in the conventional image (CT/US) guided FNA group, and 2 (14.3%) were in the EUS-guided FNA group. The p-value for this comparison is 0.999. In terms of inconclusive diagnoses, 6 out of 14 patients (42.9%) belonged to the conventional image (CT/US) guided FNA group, whereas 2 (14.3%) were in the EUS-guided FNA group. The p-value for this comparison is 0.209. Lastly, none of the patients in the conventional image (CT/US) guided FNA group (0.0%) were diagnosed with benign or lymph node disease, while 1 (7.1%) patient in the EUS guided FNA group received this diagnosis. The p-value for this comparison is 0.999.

Discussion

In our study of 28 patients, we observed no significant differences in the socio-demographic variables between the two groups. However, this lack of significance was not evident in these variables, but it holds importance when we compare other factors. The clinical characteristics we considered were fairly similar in both groups, as no statistically significant differences were detected in any of the parameters. A recently published retrospective study involving 1,000 cases of pancreatic FNA also reported that EUS-guided FNA was more accurate than conventional image-guided techniques for masses less than 3 cm in size [10,11]. In our investigation, we noted that the mean size of lesions in the conventional

image (CT/US) guided FNA group was 2.40 ± 0.39 cm, while in the EUS-guided FNA group, it was 2.69 ± 0.5 cm. Numerically, this finding aligns with previous studies. However, this difference did not achieve statistical significance. The number of needle passes is critical in obtaining sufficient tissue samples from suspected lesions. EUS-guided FNA outperforms conventional image (CT/US) guided FNA because of its reduced risk of injuring intra-abdominal tissues due to a shorter needle course and more precise delineation of the pathological mass. Given the smaller size of the lesions, precise targeting is essential. Moreover, EUS and EUS FNA reduce the risk of cutaneous or peritoneal contamination compared to conventional image-guided investigations and are less invasive than surgical interventions. Consequently, EUS-guided FNA is increasingly becoming the standard for obtaining cytological diagnoses [12]. Considering tissue yield accuracy, we found that 8 out of 14 (57.1%) CT/US-guided FNA cases provided adequate cells for diagnosis, compared to 12 out of 14 (85.7%) in the EUS-guided FNA group. In the CT/US-guided group, five patients had insufficient cells for a conclusive tissue report, a significantly higher occurrence than in the EUS-guided group. Horwath., *et al*. [10] recently presented a unique randomized prospective cross-trial comparing EUS-guided FNA to conventional image (CT/US) guided FNA for diagnosing cancer in pancreatic mass lesions. Our study categorized FNA cytology results into four groups: positive for malignancy, no malignancy, other specific diagnoses (e.g., pancreatitis, lymph nodes, etc.), and inconclusive. While these values numerically favored the EUS-guided FNA method, they did not achieve statistical significance. Similarly, when considering the diagnosis of malignancy alone, the values were 35.7% and 64.3% for the CT/US-guided FNA and EUS-guided FNA groups, respectively. Again, this difference was not statistically significant. A few patients in both groups reported minor complaints of pain, fever, and nausea, but none of these symptoms reached statistical significance. Importantly, we did not encounter any cases of procedure-induced bleeding or injuries to other organs. Micames., *et al*. [13], in their retrospective, non-randomized series comparing CT-guided FNA with EUS-guided FNA for pancreatic masses, found significantly more peritoneal failures after neoadjuvant chemoradiation in patients who underwent the CT-guided procedure (16.3%) compared to those who had EUS-guided FNA (2.2%).

Conclusion

Regarding numerical data, EUS-guided FNA demonstrates superior precision in detecting pancreatic malignancy and, consequently, higher accuracy in obtaining sufficient tissue samples for cytological evaluation and interpretation than conventional image-guided FNA methods such as CT or US. However, it is important to note that statistically speaking, deeming it a superior modality or advocating for it as the preferred method over conventional techniques (CT/US-guided FNA) may not be justified.

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