

Time-of-day effect and the yield of endoscopic ultrasound fine needle aspiration

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ABSTRACT

Background and Objectives: The timing of the endoscopic procedures has been recently proposed to be a factor in the quality of colonoscopic polyp detection. We aimed to investigate whether the time-of-day has an effect on the diagnostic yield and specimen adequacy of endoscopic ultrasound fine needle aspiration (EUS-FNA). **Materials and Methods:** The retrospective study was set in a safety net community hospital. The 212 EUS-FNAs performed at our institution between July 2011 and January 2014 were retrospectively analyzed. Pancreatic masses, pancreatic cysts, and lymphadenopathy were most common indications for EUS-FNAs. Data were collected with regard to the timing of the procedure, presence of on-site cytopathologic evaluation, the number of needle passes, diagnosis, and specimen adequacy for cytopathologic evaluation. Statistical analysis was performed using unpaired two-tailed Student's *t*-test. **Results:** There was no difference in the diagnostic yield for malignancy across all indications between the AM and PM groups. In the morning group 31/87 (36%) procedures and in the afternoon group 50/125 (40%) procedures were diagnostic for malignancy ($P = 0.522$). There was no difference in the specimen adequacy for cytopathologic evaluation across all indications between the AM and PM groups. In the morning group, 58/87 (67%) procedures and in the afternoon group 90/125 (72%) procedures were adequate for cytopathologic evaluation ($P = 0.408$). On-site cytopathologist was more available for AM than PM procedures; however, the lack of AM vs. PM difference in the yield and specimen adequacy persisted regardless of on-site cytopathologist presence. **Conclusions:** Time-of-day of the procedure (morning vs. afternoon) does not affect EUS-FNA diagnostic yield for malignancy or specimen adequacy for cytopathologic evaluation.

Key words: Diagnostic yield for malignancy, endoscopic ultrasound fine needle aspiration (EUS-FNA), specimen adequacy, specimen adequacy for cytopathologic evaluation, time-of-day

INTRODUCTION

Endoscopic ultrasound (EUS) has emerged as the main diagnostic modality in the evaluation of pancreatic and peri-intestinal lesions.^[1] EUS allows for both the detailed visualization of the lesion and for tissue sampling via

endoscopic ultrasound (EUS)-guided fine needle aspiration (FNA). Reported yield of EUS-FNA for pancreatic malignancies varies from 74% to 92%.^[2-4] Multiple factors

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such as presence of on-site cytopathologist, lesion location, and needle gauge have been shown to influence the diagnostic yield of EUS-FNA.^[5-7]

Procedure timing (morning *vs.* afternoon) was recently demonstrated to influence the diagnostic yield of endoscopic procedures. Morning colonoscopy has been shown to detect significantly more adenomas than procedures performed later in the day.^[8-11] The total number of detected hyperplastic and adenomatous polyps found decreased hour by hour as the day progressed; early-morning cases yielded 27% more polyps per patient than afternoon cases. The effect persisted after controlling for quality of bowel preparation, and the endoscopist's fatigue was thought to play a role in the polyp detection difference between morning and afternoon procedures.

There is currently a paucity of data regarding time-of-day effect on the diagnostic yield and specimen adequacy of EUS-FNA. Improving the yield of EUS-FNA is critical as it could prevent repeat procedures and potential delay in care.

We aimed to investigate whether the time-of-day has an effect on the diagnostic yield and specimen adequacy of EUS-FNA.

MATERIALS AND METHODS

Two hundred and twelve EUS-FNAs performed at our institution between July 2011 and January 2014 were retrospectively analyzed. EUS-FNA indications were pancreatic masses; pancreatic cysts; lymphadenopathy; and gastric, adrenal, liver, and intra-abdominal masses. Data were collected with regard to the timing of the procedure, presence of on-site cytopathologic evaluation, and the number of needle passes. The data were compared separately for specimens establishing a tissue diagnosis and non-diagnostic samplings, in addition to specimen adequacy for cytopathologic evaluation.

EUS-FNA specimens obtained from all procedures were categorized as positive for malignancy, atypical/suspicious for malignancy, negative for malignancy, or inadequate for cytopathologic examination. Nondiagnostic specimens were defined as either aspirates in which the cytologic specimen was inadequate to characterize the lesion or the materials that were not considered representative of the target lesion.

We defined diagnostic yield as percentage of positive diagnostic specimens of the total number of EUS-FNA performed. We defined specimen adequacy as percentage of specimens with adequate cellularity of the total number of EUS-FNAs performed.

Procedures with start time before 1 pm were considered the AM group, and procedures with start time after 1 pm were placed in the PM group. All procedures (morning and afternoon) were randomly distributed between three endoscopists (DC, SR, VE) with extensive experience in EUS-FNA. All EUS-FNAs were performed with linear Olympus echoendoscope (Japan) using standard technique; 10 throws were performed per pass using the fanning technique.^[12] The choice of FNA needle gauge and use of stylet and air suction was left at the discretion of the endoscopist. Unpaired two-tailed Student's *t*-test was used for statistical analysis of the data.

RESULTS

Patient demographics and procedure indications were similar between the AM and PM groups [Table 1]. Eighty seven of the 212 (41%) procedures were performed in the morning (before 1 pm) while 125 of 212 (59%) procedures were performed after 1 pm. Solid pancreatic masses, pancreatic cysts, and lymphadenopathy were most common indications in both groups.

There was no difference in the diagnostic yield for malignancy across all indications between the AM and PM groups [Figure 1] and, in particular, for solid pancreatic

Table 1. Patient demographics and procedure indications

	EUS-FNA N = 212	
	AM N = 87	PM N = 125
Age (average)	58.2	59.2
Male (%)	43 (49%)	64 (51%)
Pancreatic mass	24	41
Lymphadenopathy	25	31
Pancreatic cyst	24	29
Adrenal	1	4
Gastric mass	4	3
Intra-abdominal mass	2	3
Pancreatic nodule	3	2
Other*	4	12

*Other include mediastinal, duodenal, bile duct, lung, and liver masses, EUS-FNA: Endoscopic ultrasound fine needle aspiration

masses [Figure 2]. Out of all the procedures, 31/87 (36%) procedures in the morning and 50/125 (40%) in the afternoon group were diagnostic for malignancy ($P = 0.522$). Overall, in accordance with the previous reports, the diagnostic yield for malignancy was significantly higher for solid pancreatic masses [39/65 (60%)] and lymph nodes [25/56 (45%)] than for pancreatic cysts [1/53 (2%)]. Ductal adenocarcinoma was the most common cytologic diagnosis among solid pancreatic masses.

There was no difference in the specimen adequacy for cytopathologic evaluation across all indications between the AM and PM groups [Figure 3]. In the morning group 58/87 (67%) procedures and in the afternoon group 90/125 (72%) procedures were adequate for cytopathologic evaluation ($P = 0.408$). The specimen adequacy was significantly higher for pancreatic masses [52/65 (80%)] and lymph nodes [41/56 (73%)] than for pancreatic cysts [24/53 (45%)] ($P \leq 0.0001$ and $P = 0.0027$, respectively).

The same EUS-FNA needle sizes were used in the AM and PM groups. In particular, 19-, 22-, and 25-gauge needles were used in 4/87 (5%), 55/87 (63%), and

14/87 (16%) in the AM group and 4/125 (3%), 80/125 (64%), and 22/125 (18%) in the PM group; the combinations of 19- and 22-gauge needles and 22- and 25-gauge needles were used in 1/87 (1%) and 13/87 (15%) in the AM group and 2/125 (2%) and 17/125 (14%) in the PM group, respectively.

An average of 4.9 passes was made in the diagnostic EUS-FNAs *vs.* 3.6 passes in the nondiagnostic group. An average of 4.4 passes and 3.3 passes were made in EUS-FNAs with adequate specimens and inadequate specimens, respectively.

Immediate on-site cytopathologic evaluation was available for 47/212 (22%) of all procedures. On-site cytopathologist was available for 27/87 (31%) morning procedures and 20/125 (16%) afternoon procedures, which had fewer adequate specimens and malignancy diagnoses [Figure 4]. However, regardless of on-site

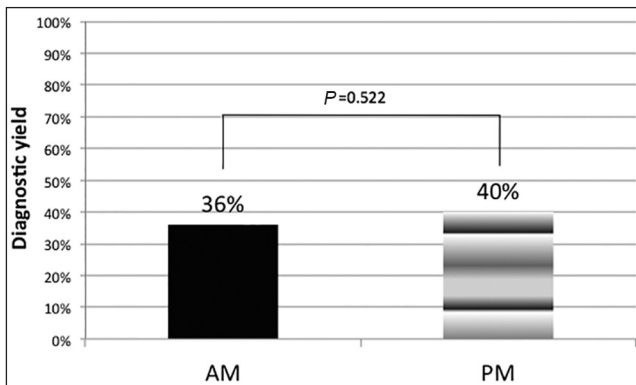


Figure 1. Endoscopic ultrasound fine needle aspiration (EUS-FNA) diagnostic yield for malignancy across all indications for the morning and afternoon procedures

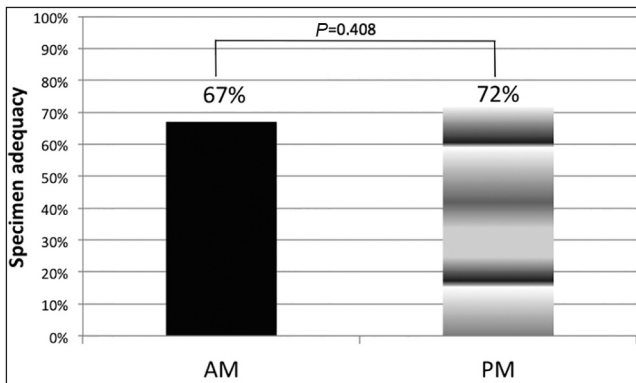


Figure 3. Specimen adequacy

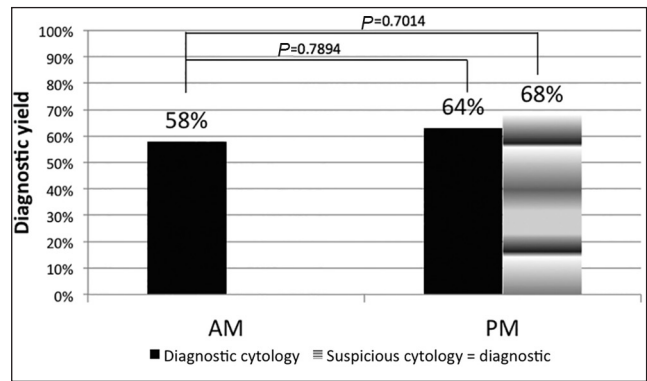


Figure 2. Diagnostic yield for endoscopic ultrasound fine needle aspiration (EUS-FNA) of solid pancreatic masses. There was no atypical/suspicious malignant cytology in the morning group

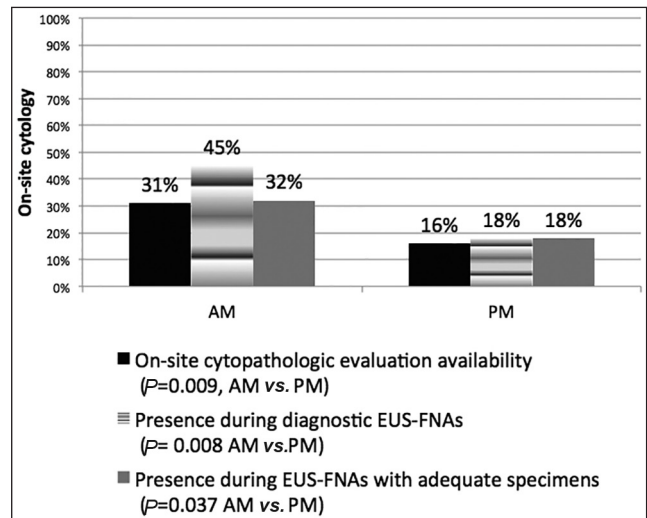


Figure 4. On-site cytology evaluation availability

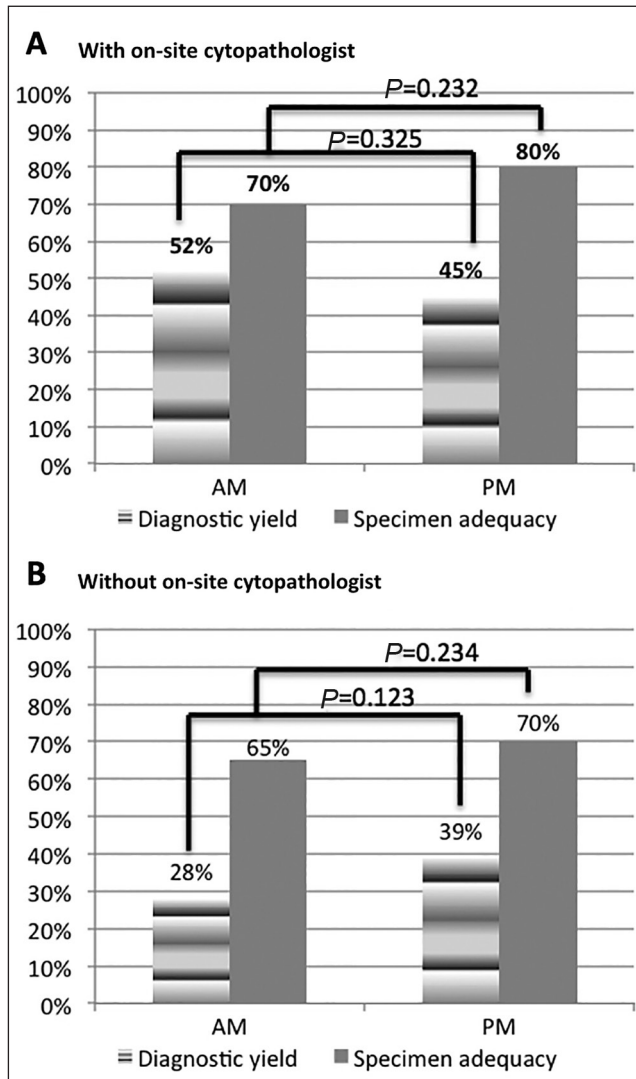


Figure 5. Diagnostic yield for malignancy and specimen adequacy with or without on-site cytopathologist during morning and afternoon endoscopic ultrasound fine needle aspirations (EUS-FNAs)

cytopathologist presence, there was no time-of-day effect [Figure 5].

DISCUSSION

Improving specimen adequacy and diagnostic yield of EUS-FNA is an important clinical issue. Inconclusive EUS-FNAs often lead to repeat procedures and potential delay in malignancy diagnosis. Over the years, multiple factors were shown to impact the EUS-FNA yield. In our study, there was no difference in the diagnostic yield for malignancy and specimen adequacy for cytopathologic evaluation between morning and afternoon procedures, and no time-of-day effect remained regardless of on-site cytopathologist presence.

Time-of-day also did not affect endoscopic retrograde cholangiopancreatography (ERCP) outcomes in the study of 296 patients by Mehta *et al.*^[13] Cannulation success, procedure completion times, length of procedures, and adverse events were not statistically different between the morning and the afternoon procedures. One possible explanation for the lack of time-of-day effects is that the repetitive nature of colonoscopy might contribute to operator fatigue and decreased adenoma detection rates in the afternoon colonoscopies,^[8-11] whereas both ERCP and EUS-FNA often require continual attention of the operator, and thus are less likely to be affected by the operator fatigue.

CONCLUSION

In conclusion, time-of-day of the procedure (morning *vs.* afternoon) does not affect EUS-FNA diagnostic yield for malignancy or specimen adequacy for cytopathologic evaluation.

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Conflicts of interest

There are no conflicts of interest.

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