

# Patients with Suspected Pancreatic Cancer: Importance of Adjunctive FNA of Pancreatic Duct Fluid, Ascites and Liver Lesions



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## Introduction

- Role of EUS in the diagnosis and staging of patients with suspected Pancreatic Cancer is well established.
- Accuracy of EUS FNA tissue diagnosis is 80-90%.
- False negative results may be operator dependent, inadequate tissue sampling and a variety of anatomical variables.
- Staging accuracy is of critical importance in determining treatment options (resection vs palliative).
- Patients with unsuspected liver mets and those with malignant ascites confirm advanced disease and thus poor outcome.
- The role of adjunctive FNA of pancreatic duct fluid, ascites and liver lesions has been inadequately described.

## Aim of Study

To determine the role of adjunctive EUS guided FNA in patients with Pancreatic Cancer including ascitic fluid, pancreatic juice and associated liver lesions.

## Methods

- During an 8-yr period (1/01-1/09), 152 patients with suspected/confirmed pancreatic mass by CT (CT positive= 88, CT negative= 33, CT equivocal= 31) were referred for EUS/FNA for diagnosis/staging.
- Patients without Pancreatic Cancer on FNA or F/U were excluded from analysis.
- Endosonography was performed initially with radial endosonography (Olympus Corporation) identifying all relevant anatomic abnormality including pancreas, liver, celiac trunk, superior mesenteric artery (SMA).
- Subsequent, linear endosonography (Olympus Corporation) was performed with FNA of the primary pancreatic mass, pancreatic duct juice, ascites, and liver masses when present.

## Results I

- Pancreatic mass was located in HOP (n=85), BOP (n=38), TOP (n=29).
- In patients with HOP mass, FNA was positive (n=75), negative (n=4), atypical (n=6).
- In patients with BOP mass, FNA was positive (n=31), negative (n=4), atypical (n=3).
- In patients with TOP mass, FNA was positive (n=24), negative (n=3), atypical (n=2).

## Results II

- Adjunctive FNA was performed in 28 patients with HOP mass (14 duct, 9 ascites, 5 liver), 15 patients with BOP (7 duct, 5 ascites, 3 liver), 7 patients with TOP mass (1 duct, 3 ascites, 3 liver).
- Of the 16 patients with negative atypical FNA in HOP mass, 5 adjunctive FNA were positive (3 duct, 1 ascites, 1 liver).
- Of the 10 patients with negative/atypical FNA in BOP mass, 5 adjunctive FNA were positive (2 duct, 1 ascites, 1 liver).
- Of 4 patients with negative/atypical FNA in TOP mass, 2 adjunctive FNA were positive (1 ascites, 1 liver).
- No complications were encountered in this patient series

## Conclusion

Patients presenting with clinical or radiographic suspicion of Pancreatic Cancer, accuracy of EUS FNA of the primary tumor is high but not optimal. Adjunctive FNA of pancreatic juice, ascites and liver lesions is safe; improves tissue diagnosis and may identify patients who may be unresectable, necessitating palliative treatment.

## Table I

FNA	n	Mass- FNA Negative/Atypical		
		HOP (n=10)	BOP (n=7)	TOP (n=5)
Duct	5	3	2	0
Ascites	3	1	1	1
Liver	3	1	1	1
Total	11	5	4	2

Adjunctive FNA of pancreatic juice, ascites fluid, and suspicious liver lesions in patients with negative/atypical FNA of primary mass.

## Figures:

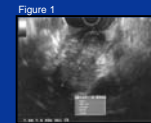


Figure 1  
EUS guided FNA of primary liver mass.

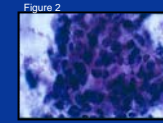


Figure 2  
FNA showing Adenocarcinoma following sampling of primary pancreatic mass.



Figure 3  
EUS image in a patient with pancreatic Adenocarcinoma demonstrating metastatic liver lesions.

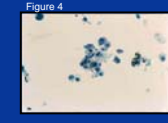


Figure 4  
FNA of patient with a 1cm liver nodule showing metastatic Adenocarcinoma

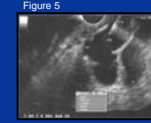


Figure 5  
EUS FNA of a dilated pancreatic duct in a patient with a pancreatic head mass.

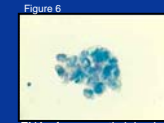


Figure 6  
FNA of pancreatic juice in a patient with a dilated pancreatic duct showing Adenocarcinoma



Figure 7  
Cytology showing Adenocarcinoma from FNA of ascites fluid.

## Table II

FNA	n	Location-Mass								
		HOP (n=85)			BOP (n=38)			TOP (n=29)		
		Pos	Neg	Atyp	Pos	Neg	Atyp	Pos	Neg	Atyp
Mass	152	75	4	6	31	4	3	24	3	2
Duct	22	8	4	2	4	2	1	1	0	0
Ascites	17	6	3	0	3	1	1	3	0	0
Liver	11	4	1	0	3	0	0	3	0	0

Results of FNA of primary tumor and adjunctive sites based on location of pancreatic mass.

# Accuracy of Post-Procedure Endoscopic Retrograde Cholangiopancreatography (ERCP) Spot Film Interpretation by Radiologists – a Pilot Study

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## Introduction

- Post-procedure interpretation of ERCP films by radiology (RAD) is routinely performed; however, the necessity and accuracy of this practice have been disputed.
- Although x-ray technicians provide a written report of pathology and accessories employed, frequent discrepancies arise between interpretation of real-time fluoroscopy by a gastroenterologist (GI) and subsequent spot film evaluation by RAD.
- This may alter patient care and generate a discordant medical record with future medicolegal implications.
- RAD interpretation of ERCP films at tertiary care centers is under scrutiny.
  - 16 advanced endoscopists recently polled
  - 0 have a radiologist present during ERCP
  - 0 base therapeutic decisions on RAD interpretation
  - 3 don't use RAD for film interpretation
  - 6 don't use x-ray technicians
  - 8 review RAD interpretation  $\leq$  50% of the time
  - 11 foresee potential medicolegal issues stemming from discordant x-ray reports.

## Aim of Study

- To assess accuracy of ERCP spot film interpretation by RAD
  - Pancreatobiliary pathology
  - Accessories utilized
- To determine influence of inconsistencies on patient care and medical record
  - Unnecessary imaging/labs/procedures
  - Undue cost/risk
  - Medicolegal consequences

## Methods

- Prospective analysis of 150 consecutive ERCPs at a tertiary care center
- Real-time fluoroscopy interpretation by GI was compared to RAD interpretation of post-procedure films
- Pancreatobiliary pathology
  - Stone disease
  - Stricture
  - Duct dilation
  - Duct obstruction
  - Duct disruption
  - Anatomic variants
  - Pancreas divisum
  - IPMN
  - Altered surgical anatomy
- Accessories
  - Stent (variable caliber/length)
  - Balloon dilator
  - Catheter dilator
  - Cytology brush
  - Mechanical lithotripter
  - Biliary biopsy needle
  - Spyglass choledochoscopy
- Spot films were obtained clearly demonstrating all accessories used

## Results I \*

- ERCPs findings (GI):
  - Biliary**
    - 45 dilated ducts
    - 32 stones
    - 24 strictures
  - Pancreatic**
    - 33 dilated ducts
    - 30 strictures
    - 9 duct stones
    - 8 disruptions
    - 7 divisum
    - 4 obstructions
    - 2 IPMNs
    - 1 Puestow
- Accessories:
  - 79 balloon sweeps/dilts
  - 57 pancreatic stents
  - 23 biliary stents
  - 22 cytology brushes
  - 21 catheter dilators
  - 12 mech lithotriptors
  - 8 Spyglass
  - 3 biliary bx needles

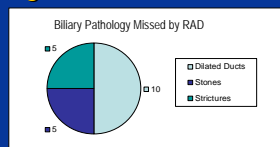
## Results II \*\*

- Pathology missed by RAD:
  - Biliary**
    - 10 dilated ducts
    - 5 stones
    - 5 strictures
  - Pancreatic**
    - 6 dilated ducts
    - 5 strictures
    - 4 pancreas divisum
    - 3 disruptions
    - 1 duct stone
    - 1 duct obstruction
    - 1 Puestow anatomy
- Accessories missed by RAD:
  - 11 balloon sweeps/dilations
  - 11 catheter dilators
  - 6 cytology brushes
  - 5 Spyglass
  - 1 pancreatic stent

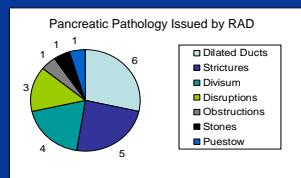
## Results III \*\*\*

- Pancreatobiliary RAD Accuracy:
  - Biliary**
    - 84% stones
    - 79% strictures
    - 78% dilated ducts
  - Pancreatic**
    - 89% stones
    - 83% strictures
    - 82% dilated ducts
    - 75% obstructions
    - 63% disruptions
    - 43% divisum
    - 0% Puestow anatomy
- Accessory RAD Accuracy:
  - 100% biliary stents
  - 100% biliary bx needles
  - 100% mech lithotriptors
  - 98% pancreatic stents
  - 86% balloon sweeps/dilts
  - 73% cytology brushes
  - 48% catheter dilators
  - 38% Spyglass

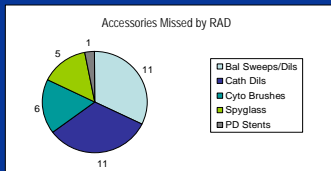
## Figure I \*



## Figure II \*\*



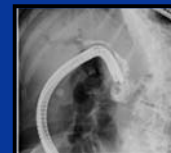
## Figure III \*\*\*



## Table I

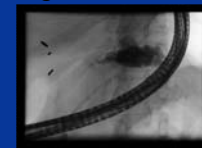
	Stones	Strictures	Dilated Ducts	Duct Obstruct	Duct Disrupt	Divisum	Puestow
Biliary	84%	79%	78%	-----	-----	-----	-----
Pancreatic	89%	83%	82%	75%	63%	43%	0%

## Figure IV



Stone Material in Biliary Stent Misread as Air

## Figure V



Acinarization misread as a duct leak

## Recommendations

- In high volume pancreatobiliary centers with experienced endoscopists, official ERCP interpretation should be the sole responsibility of the gastroenterologist.
- In centers with less experience, a radiologist should be present for the interpretation of real-time ERCP images.

## Conclusion

- RAD accuracy:
  - $\geq$  78% for biliary findings (max 84%)
  - $\geq$  43% for pancreatic findings (max 89%)
  - $\geq$  38% for accessories (max 100%).
- Difficulty noted in identifying anatomical variants (divisum and Puestow anatomy)
- Catheter dilation & Spyglass identification lower than expected.
- No further studies or procedures resulted from RAD inaccuracy.
  - Miss rate for biliary and pancreatic stones of 16% and 11%, respectively, is problematic.
  - Future studies and procedures would be required to correctly identify and to definitively intervene if not handled during initial ERCP.
- Concerning RAD trends:
  - Over read of biliary stricture/dilation in 4 cases
  - Difficulty discerning between biliary air and stones in 3 cases
  - Pancreatic acinarization misread as duct leak in 2 cases
    - Results in discordant medical records
    - Prompts unnecessary imaging, lab work, and procedures
    - Generates undue cost, patient risk, and medicolegal consequences
- This pilot study has highlighted areas of potential improvement.
  - Post-procedure summary sheet in development
    - Areas of attention/intervention noted
    - Accessories employed
  - Re-evaluation of RAD accuracy is planned to assess efficacy of these "informed reads" in the future.

# Colonoscopy At An Ambulatory Center: Does Total Polyp Detection Act As A

## Surrogate Marker For A Complete Colonoscopic Exam?

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### Introduction

- Colonoscopy is a powerful tool decreasing the incidence of colorectal cancer (CRC), 2nd leading cause of death from cancer.
- Screening reduces risk by detection of adenomatous polyps and consequent interruption of the "polyp cancer sequence".
- The national polyp study demonstrated a 76-90% reduction in colorectal cancer incidence over prolonged surveillance.
- Published data reported missed neoplastic lesions during repeat colonoscopy not discovered on initial (6-27%).
- Prep adequacy, experience of endoscopist, and withdrawal time contribute to successful (complete) screening.
- This study focuses to measure "polyp detection" rather than adenoma detection as surrogate marker of complete endoscopic examination.

### Methods

- Data was prospectively gathered on 7,999 colonoscopies performed between 1/07- 9/09 at an ambulatory center involving 6 physicians.
- Those with active GI bleed were excluded
- All those presenting for surveillance & screening colonoscopy included.
- Physician practices were reported on yearly basis with regards to polyp detection and withdrawal time by Quality Assurance Committee.
- Following factors were tabulated:
  - physician experience
  - average number of colonoscopy per physician over 3-year period
  - % patients with polyps
  - number polyps and adenomas per patient
  - location of polyps
  - average withdrawal time
- Withdrawal time and cecal intubation were recorded by nursing staff after notification by physician.

### Results I

- Polyp detection ranged from .31 - .64 among 6 endoscopists
- Number of colonoscopies ranged from 143 - 989 per endoscopist/year
- Percentage of withdrawal time > 5-minutes was greatest for the physicians in first year of practice.
- No correlation was found between missed polyp rate and location.

### Results II

- Withdrawal time did not vary in each of 3 consecutive years per physician.
- Highest number of adenomas per patient was found by physicians in first year of practice.
- Physician with lowest adenoma detection also represented the one with highest withdrawal time percentage of <5-minutes.
- Those with highest adenoma detection spent more time upon withdrawal of colonoscope (>5-minutes).
- Polyp detection rate for physician in first year of practice compared very favorably to other more seasoned physicians.

### Aim I

- Assess the variability in polyp detection with respect to polyp location
- Do physician practices change with respect to withdrawal time and polyp detection when results of these variables are reviewed yearly?

### Aim II

- Determine the performance of a gastroenterologist in the year of practice with regards to withdrawal time, adenoma and total polyp detection among more seasoned gastroenterologists.
- Determine if there was a difference in adenoma detection vs. all polyp detection.

### Table I

Variability of Polyp Detection Rate Among 6 Physicians Over a 3-Year Period

	MD 1		MD 2		MD 3		MD 4		MD 5		MD 6*		
	Y1	Y2	Y3	Avg	Y1	Y2	Y3	Avg	Y1	Y2	Y3	Avg	
Pt with Polyps (%)	.67	.62	.65	.65	.32	.31	.5	.29	.39	.40	.32	.37	.33
# of Polyps per Pt	1.3	1.2	1.2	1.2	0.6	0.6	0.5	0.6	0.7	0.8	0.5	0.7	0.5
WD <5min (%)	.13	.17	.21	.17	.16	.27	.32	.25	.14	.14	.6	.11	.39
WD > 5min (%)	.87	.83	.79	.83	.84	.73	.68	.75	.86	.86	.94	.89	.61
# of Adenomas per Pt	0.5	0.6	0.5	0.5	0.3	0.3	0.2	0.3	0.4	0.5	0.3	0.4	0.2

\* Physicians in first year of practice

\*\* Each Physician receives an annual performance report

### Table II

Does the Withdrawal Time Affect Polyp Detection Rate?

MD	Exp Yrs	Avg # colons/yr	Pt with polyps	Polyps/pt	WD <5min	WD >5min
1	17	989	.65	1.22	17	83
2	15	673	.29	.55	25	75
3	20	582	.37	.65	11	89
4	11	278	.30	.45	36	64
5	22	143	.38	.66	30	67
6*	1	326	.54	1.12	6	94

\* Physicians in first year of practice

### Table III

Polyp Detection Rate: Does Location Matter?

Physician	Rectosigmoid %	Transverse %	Ascending %	Descending %	Cecum %	# polyps/pt
1	57	12	16	6	8	1.22
2	50	17	12	10	8	.55
3	40	24	19	6	10	.65
4	48	14	20	7	11	.45
5	61	13	9	10	7	.66
6*	39	17	23	14	8	1.12

\* Physicians in first year of practice

### Table IV

Ranking of Physicians as Function of Polyp Detection Rate and Withdrawal Time

Variable	MD Rank					
	MD 1	MD 2	MD 3	MD 4	MD 5	MD 6*
% Patient with Polyps	1	6	4	5	3	2
Number Polyps per Patient	1	5	4	6	3	2
% Withdrawal < 5.Min	3	4	2	6	5	1
Number of Adenomas per patient	2	5	3	6	4	1

\* Physicians in first year of practice

### Table V

Multivariable Analysis of Polyp Detection Rate

Variables	Correlation Coefficient (Spearman)	P Value
Adenoma Detection	.9429	.0048
Percent Patient With Polyp	.9429	.0048
Experience	.1429	.7872
% Fast Withdrawal(<5min)	-.6000	.2080
% Slow Withdrawal(>5 min)	.6000	.2080

### Conclusion

- The number of total polyps discovered per patient acts as surrogate marker of a thorough colonoscopic examination.
- There was a strong correlation between adenoma detection and longer withdrawal time.
- Physicians in first year of practice demonstrate favorable results in terms of adenoma detection and withdrawal time to experienced physicians.
- There was no significant difference between polyp detection rate with respect to experience and withdrawal time.
- Rapid withdrawal misses polyps uniformly throughout the colon.
- Despite yearly performance reports, physician habits may be difficult to change.

# Dorsal Pancreatic Duct Stones In Pancreas Divisum: Demographics, Associated Factors, Presentation, Management, Recurrence, & Clinical Course

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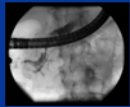


## Introduction

- Pancreas divisum (PDIV) is the most common congenital anatomic variant of the pancreas, in which ventral and dorsal ducts fail to fuse.
- Dorsal pancreatic duct (DPD) stones have been described in PDIV, which can cause acute flares of chronic pancreatitis and chronic abdominal pain.
- Although successful removal of ventral pancreatic duct stones is possible in over 70% of cases with improved symptoms, PDIV with DPD stones may present additional challenges.

## Aim of Study

- To determine rate of PDIV complicated by DPD stones
- To identify trends among patients with PDIV and DPD stones
- To determine success rate of endoscopic therapy in management of PDIV with DPD stones



Pancreas Divisum with DPD stones

## Methods I

- Retrospective chart review of 147 consecutive patients with PDIV to identify cases with DPD stones
  - Historical data:
    - Rate of PDIV complicated by DPD stones
    - Time from diagnosis of PDIV to detection of DPD stone disease
    - Symptoms at time of DPD stone detection
      - Etiology of symptom flare
- Demographic data:
  - Age/Sex/Ethnicity
  - Type II diabetes
  - Coexistent autoimmune disease
  - Psychiatric illness
  - Cigarette/alcohol use
  - Family history of pancreatitis

## Methods II

- DPD stone characteristics
- Success rate of DPD stone intervention:
  - Total number of ERCPs
    - Sphincterotomy
    - Balloon sweep/dilation
    - Catheter dilation
    - Mechanical lithotripsy
    - Spyglass choledochoscopy with electrohydraulic lithotripsy
  - Persistence/Recurrence of DPD stones
  - Coexistent pathology:
    - DPD stricture
    - Pseudocyst

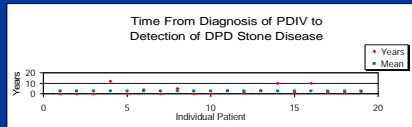
## Methods III

- Follow-up:
  - Dorsal duct clearance
  - Persistent symptomatology - further treatment options
    - Celiac plexus block
    - Surgical intervention
  - Pancreatic cancer
  - Death

## Results I \*

- 12.9% of PDIV was complicated by DPD stone formation.
  - Ages 21-82
    - 12 males/7 females
    - 16 Caucasian/2 Hispanic/1 Black
  - 78.9% smoked cigarettes
  - 68.4% drank alcohol
  - 47.3% had type II diabetes
  - 47.3% had depression/mood disorder
  - 26.3% had autoimmune disease
    - 4 patients had hypothyroidism
      - 1 patient had increased IgG4 levels
  - 5.3% had a sibling w/pancreatitis (idiopathic)
  - Time from diagnosis of PDIV to detection of DPD stone disease
    - Range 0-12 yrs
    - Mean 2.6 yrs

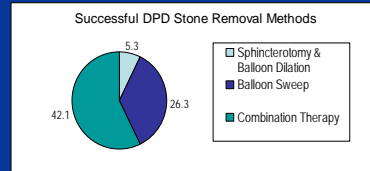
## Figure I \*



## Results II \*\*

- 78.9% had symptoms at time of DPD stone detection (nausea, vomiting, abdominal pain, weight loss)
  - Idiopathic trigger (47.3%)
    - Ongoing alcohol (31.6%)
- DPD stones:
  - 15.8% debris
    - 84.2% small
      - 11 mm = largest
  - 89.5% multiple
- Successful DPD stone removal methods:
  - 5.3% sphincterotomy and balloon dilation
  - 26.3% balloon sweep
  - 42.1% combination therapy
    - Balloon sweep/dilation
    - Catheter dilation
    - Mechanical lithotripsy
    - Spyglass choledochoscopy with electrohydraulic lithotripsy
- Follow-up ranged from 9 months - 14 years after DPD stone removal.
  - 63.2% had recurrent/persistent DPD stones.
  - 89.5% had DPD strictures

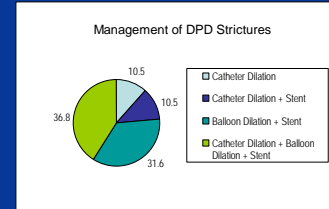
## Figure II \*\*



## Results III \*\*\*

- Management of DPD strictures:
  - 10.5% catheter dilation
  - 10.5% catheter dilation + stent
  - 31.6% balloon dilation + stent
  - 36.8% catheter dilation + balloon dilation + stent
- Number of ERCPs performed after diagnosis of PDIV w/DPD stones ranged from 0-27.
  - Mean 6
  - Median 3
- Cumulative number of DPD stents placed in each patient ranged from 0-19.
  - Mean 7
  - Median 5
- 42.1% rate of pancreas cyst formation (prior to ERCP)
- Follow-up (2-14 years):
  - 57.9% had no/rare symptoms
  - 42.1% had persistent symptoms
    - 15.8% underwent surgery after celiac plexus block
    - No patients developed pancreatic cancer
    - 1 patient died (unrelated cause)

## Figure III \*\*\*



## Table I

Rate of Endoscopic Success in Management of DPD Stone Disease

	Improved Symptoms	DPD Stricture	Multiple DPD Stones	Successful Stone Removal	Stone Recurrence
Yes	57.9%	89.5%	89.5%	78.9%	63.2%
No	42.1%	10.5%	89.5%	21.1%	36.8%

## Conclusion

- Approximately 1/8 patients with PDIV developed DPD stones.
  - White male predominance
  - Cigarette and alcohol use common
  - Type II DM and depression/mood disorder were also associated; however, it's unclear if these represent risk factors or sequelae
- Multiple DPD stones were most common.
- 78.9% had successful stone removal with combination therapy proving most effective.
- DPD stone recurrence was notable, however.
  - Likely due to stagnant flow and high stricture rate
- Endoscopic therapy afforded symptomatic improvement in the majority of patients and prevented surgery in all but 3 cases.