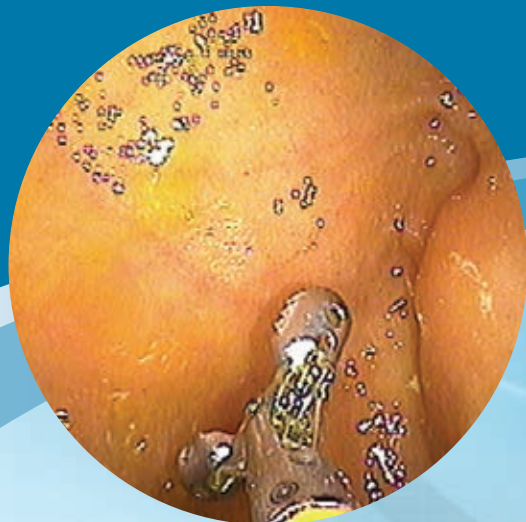


# Radial Jaw<sup>®</sup> 4 Single-Use Biopsy Forceps

Technique Spotlights

Boston  
Scientific



## Pathologist's Perspective

Shriram Jakate, MD, FRCPath  
Rush University Medical Center  
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## Cases Presented by:

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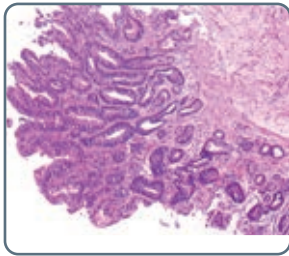
Christian S. Jackson, MD  
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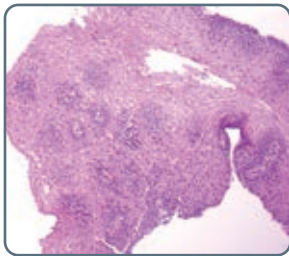
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Hitchcock Clinic  
Manchester, NH

# Samples Like Never Before

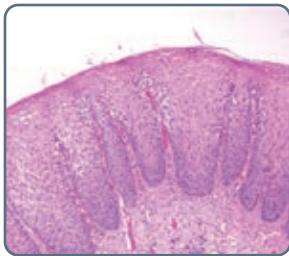




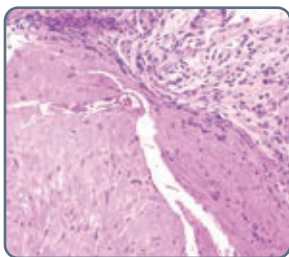
*Figure 1*  
Optimally oriented piece from Barrett's mucosa showing high grade dysplasia and lack of surface maturation (H&E stain, magnification x100).



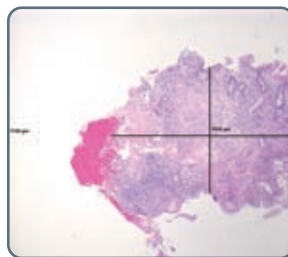
*Figure 2A*  
Biopsy of distal esophagus through standard forceps showing lack of good orientation and difficulty in diagnosis of mild GERD (H&E, magnification x100).



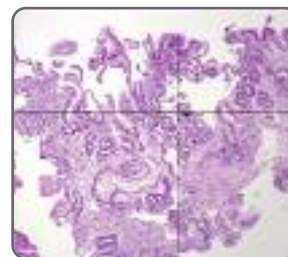
*Figure 2B*  
Biopsy of distal esophagus through Radial Jaw® 4 (RJ4) Forceps showing good orientation and ease in diagnosis of mild GERD at exactly the same magnification (H&E, magnification x100).



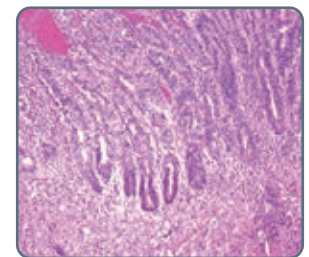
*Figure 3*  
Gastric biopsy showing submucosal spindle cell tumor, immunohistochemically confirmed as leiomyoma (H&E, magnification x200).



*Figure 4A*  
Biopsy of Barrett's mucosa through standard forceps showing a size of 1740 x 1035 µm (H&E, magnification x40).



*Figure 4B*  
Biopsy of Barrett's mucosa through RJ4 Forceps showing a size of 2924 x 1839 µm (H&E, magnification x40).



*Figure 5*  
Biopsy of intramucosal gastric carcinoma showing uninvolved submucosa and free deep margin (H&E, magnification x100).

Shriram Jakate, MD, FRCPath  
Associate Professor of Pathology  
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### Advantages for pathologists

1. Ease of optimal orientation of the biopsy specimen by virtue of larger size and consistent inclusion of muscularis mucosa. This enables embedding the tissue on its side and creating sections with proper orientation. Optimal orientation can be crucial in instances such as evaluation of lack of surface maturation in dysplasia (Figure 1), assessing villous height for gluten sensitive enteropathy in duodenal biopsies, accurately measuring thickness of collagen band in collagenous colitis and looking for tall vascular pegs in GERD (Figures 2 A and B).

### Advantages for both pathologists and gastroenterologists

1. Ability to sample, confirm and evaluate submucosal masses such as GIST, leiomyoma (Figure 3), carcinoid, pancreatic rest and lipoma among others.
2. Furnishing wider and deeper surveillance samples in conditions such as Barrett's (Figure 4 A and B) and ulcerative colitis. Often the specimen size is at least twice as big, essentially doubling the total sample size for the same number of pinches compared to the standard forceps.
3. Ability to offer staging information in conjunction with EUS in specific rare superficial tumors such as localized intramucosal or early gastric carcinoma (Figure 5) with negative lateral and deep submucosal margins.

## GASTRIC SUBMUCOSAL MASS

*Case presented by:* Sri Komanduri, MD, MS  
 Assistant Professor of Medicine  
 Director, EUS  
 Section of Gastroenterology and Nutrition  
 Rush University Medical Center  
 Chicago, IL

### History

A 43-year-old female underwent a routine upper endoscopy for dyspepsia. An incidental 2 cm submucosal mass was found in the fundus of the stomach. She was referred for endoscopic ultrasound (EUS). EUS demonstrated a 2 cm mass arising from and limited to the muscularis propria (Figure 1).

### Procedure

At this time, fine needle aspiration (FNA) and jumbo biopsies were obtained using the Radial Jaw® 4 (RJ4) Jumbo Biopsy Forceps. Cytology from the FNA was suggestive of a spindle cell neoplasm but tissue was insufficient for immunohistochemistry. The biopsy specimens from the RJ4 Forceps were also diagnostic for a spindle cell neoplasm (Figure 2). The RJ4 Forceps also provided enough tissue for immunohistochemistry (Figure 3). The tumor was determined to be c-kit (-), S100(-) (Figure 4), and SMA (+) (Figure 5). This combination is diagnostic for a leiomyoma. As a result, surgery was avoided.

### Post-Procedure

The patient will have a surveillance EGD in 1 year to ensure this mass is not enlarging. A leiomyoma is a benign muscular tumor with negligible malignant potential and likely does not account for this patient's dyspepsia. On the other hand, a gastrointestinal stromal tumor (GIST) has significant malignant potential and appears no different than the leiomyoma endoscopically. The differentiation of these two muscle tumors is made by immunohistochemistry. GISTs are c-kit (+) while leiomyomas are not. Standard biopsy forceps have been inadequate for diagnosis of submucosal masses. Standard FNA has also had suboptimal results. The ability of the RJ4 Jumbo Biopsy Forceps to not only obtain the diagnosis but allow for immunohistochemistry is extremely promising and should be incorporated into diagnostic algorithms for submucosal masses.



Figure 1  
2cm fundic submucosal mass

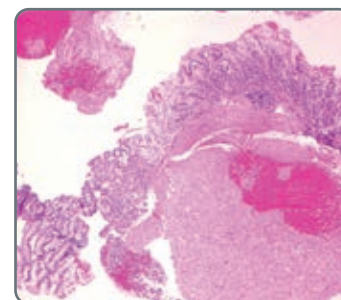


Figure 2  
Routine H&E demonstrating spindle cell tumor: RJ4 sampling

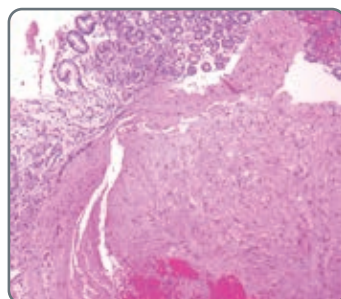
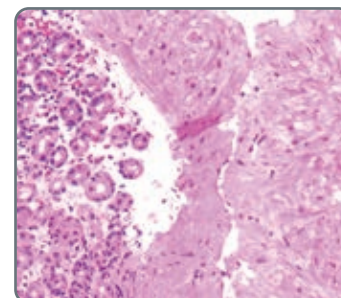


Figure 3

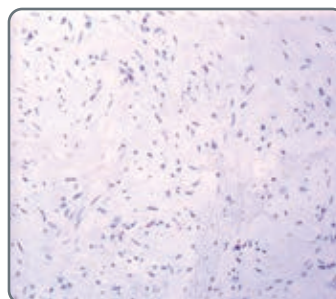


Figure 4  
C-Kit (-)

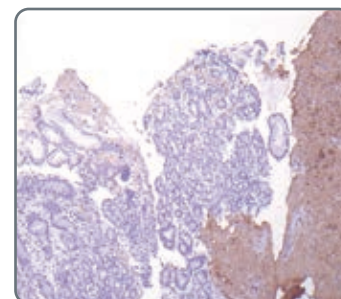


Figure 5  
SMA (+)

Case presented by: **Sri Komanduri, MD, MS**  
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 Director, EUS  
 Section of Gastroenterology and Nutrition  
 Rush University Medical Center  
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Figure 1  
 Long segment Barrett's Esophagus

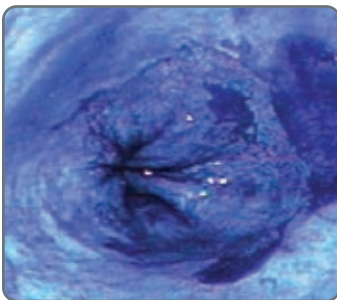


Figure 2  
 Barrett's Esophagus with  
 Methylene Blue Staining.  
 Darker stain is suggestive of dysplasia.

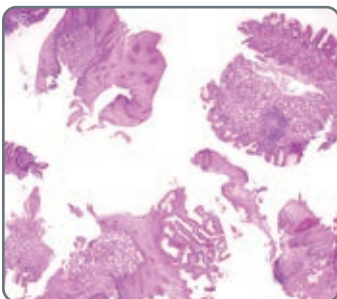


Figure 3  
 Routine H&E staining of biopsies  
 obtained with RJ3 Forceps

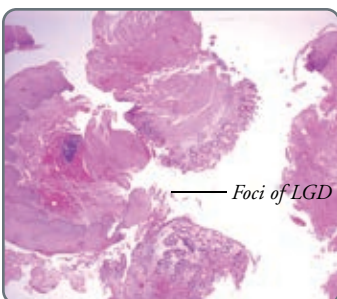


Figure 4  
 Routine H&E staining of biopsies  
 obtained with RJ4 Forceps

**History**

A 44-year-old female with no significant medical history underwent upper endoscopy for long standing Gastroesophageal Reflux (GER). The patient had been on proton pump inhibitor therapy daily for 10 years with moderate control of her symptoms. Despite this therapy, she still had significant heartburn. As a result, upper endoscopy was pursued.

**Procedure**

EGD revealed an irregular Z-line and long segment of salmon colored mucosa suggestive of Barrett's esophagus (BE) (Figure 1). Vital Staining with Methylene blue was performed to further delineate the intestinal metaplasia (Figure 2). Four quadrant sampling of this area was performed with Radial Jaw® 3 (RJ3) Large Capacity Biopsy Forceps and Radial Jaw® 4 (RJ4) Jumbo Biopsy Forceps.

**Post-Procedure**

Histopathology revealed a significant difference between the RJ3 and RJ4 (Figures 3 and 4). The samples from both forceps demonstrated intestinal metaplasia or BE, but only the samples from the RJ4 forceps demonstrated evidence of low grade dysplasia. The mean RJ4 sample was 2X wider and 2.6X deeper (width 3251 microns or 3.3 mm and depth 2573 microns or 2.6 mm) versus the standard biopsy sample (average width 1591 microns or 1.6 mm and average depth 986 microns or 1 mm) (Figure 5). While the yield in this case is not necessarily based on depth, the dramatic increase in surface area and completeness of the biopsy clearly allows for a better assessment for dysplastic change. This is an extremely exciting finding in the arena of tissue sampling in BE. A prospective investigation is underway to determine if this can truly be applied universally.

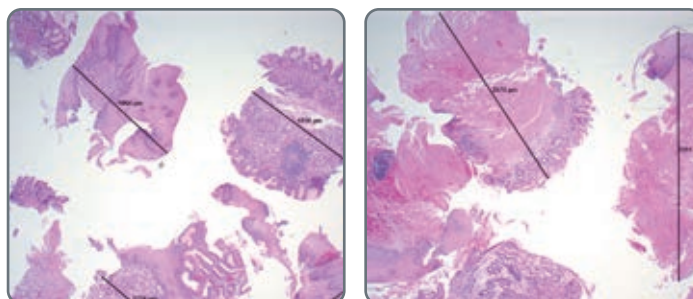


Figure 5  
 Morphometric analysis comparing RJ3 and RJ4 biopsies

## COLONIC SUBMUCOSAL MASS

*Case presented by:* Sri Komanduri, MD, MS  
 Assistant Professor of Medicine  
 Director, EUS  
 Section of Gastroenterology and Nutrition  
 Rush University Medical Center  
 Chicago, IL

### History

A 52-year-old male was referred for evaluation of a rectosigmoid submucosal mass (*Figure 1*). The patient had undergone a routine screening colonoscopy 4 weeks prior. During this examination, a 3 cm submucosal mass was seen in the rectosigmoid junction. The mass was smooth without ulceration or umbilication. Initial mucosal biopsies taken with Radial Jaw® 3 (RJ3) Large Capacity Forceps demonstrated only normal overlying mucosa.

### Procedure

At this time, we performed endoscopic ultrasound (EUS) of this lesion using a 20MHz through the scope ultrasound probe (*Figure 2*). The mass was limited to the submucosa and was hyperechoic, suggestive of a lipoma. However, given the size of this lesion, a carcinoid tumor had to be excluded. Fine-needle aspiration (FNA) with a curvilinear echoendoscope is very difficult and not practical beyond the rectum. We subsequently utilized the Radial Jaw® 4 (RJ4) Jumbo Biopsy Forceps to perform a “tunnel” biopsy. After 2 bites were taken, a moderate amount of fat was seen extruding from the mass (*Figure 3*).

### Post-Procedure

Histopathology confirmed a lipoma. The patient was reassured and no further diagnostic workup was required.

### Discussion

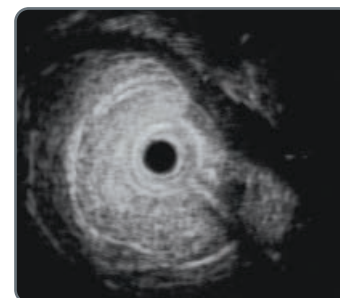
Submucosal masses of the gastrointestinal tract can be diagnostic dilemmas. Routine biopsies with standard forceps rarely provide enough tissue for diagnostic yield. Given the importance of distinguishing carcinoid tumors from lipomas and gastrointestinal stromal tumors from leiomyomas, adequate tissue sampling is essential. In the upper GI tract, EUS with FNA is the diagnostic test of choice for lesions > 1 cm. However, special consideration for the colon is necessary. FNA is impractical for lesions beyond the rectum at this time or for any lesion < 1.0 cm.

We recently demonstrated a substantial increase in tissue depth and width with the new RJ4 Jumbo Biopsy Forceps. We investigated 10 patients with Barrett’s Esophagus and found a mean increase of 0.8 mm in depth (deep submucosa) and 1 mm in width. In addition, we found 33% more dysplasia with the RJ4 Jumbo than with the RJ3 Large Capacity Biopsy Forceps. There were no complications. The increase in sample size should significantly impact our ability to detect dysplasia. The increase in depth with these forceps allows us to further address tissue sampling in submucosal lesions without complications.

We have utilized the RJ4 Jumbo Biopsy Forceps in multiple patients with submucosal lesions of the GI tract. Specifically, we have had 2 patients with GIST in which the tissue obtained with the RJ4 was significantly greater than that for EUS-FNA. In these lesions, it is essential to obtain sufficient tissue for histopathology and immunohistochemistry to allow for proper diagnosis. In our case, we were able to identify a benign lesion and avoid any further workup and cost to the patient with the utility of these forceps. The RJ4 Jumbo Biopsy Forceps appear to be an extremely promising tool when sampling submucosal lesions of the gastrointestinal tract.



*Figure 1*  
 Rectosigmoid submucosal mass



*Figure 2*  
 EUS suggestive of lipoma

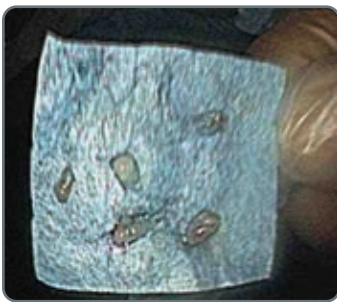


*Figure 3*  
 Fat extruding from mass

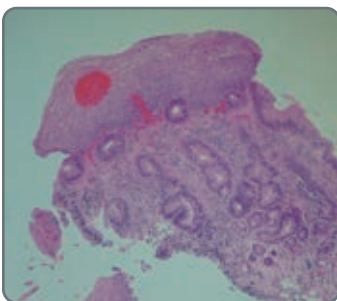
Case presented by: **Charles J. Lightdale, MD**  
 Professor of Clinical Medicine  
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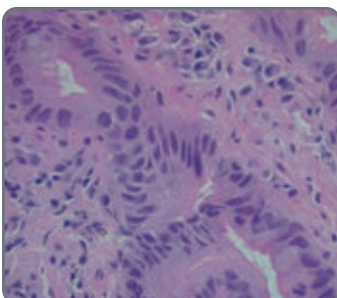
**Figure 1**  
 This endoscopic image shows the RJ4 forceps emerging from the endoscope in a retroflexed position for biopsy of the squamo-columnar junction.



**Figure 2**  
 Photo through the endoscope to show the fresh biopsy specimens.



**Figure 3**  
 Low-power histological image shows Barrett's metaplasia below squamous mucosa at the esophago-gastric junction.



**Figure 3a**  
 High-power histological image shows the Barrett's glands.

### History

A 76-year-old man was treated 2 years ago for high-grade dysplasia in long-segment Barrett's esophagus with experimental photodynamic therapy using 5-ALA. Endoscopies have shown possible residual Barrett's esophagus in short tongues at the esophago-gastric junction, but no intestinal metaplasia was present on biopsy with re-usable large capacity forceps.

### Procedure

Endoscopy again showed an irregular squamo-columnar junction without ulceration or nodularity seen at the esophago-gastric junction on either direct or retroflexed view. Using an Olympus 1T endoscope, biopsies were taken using the single-use Radial Jaw® 4 (RJ4) Jumbo Biopsy Forceps, in a four-quadrant manner (*Figure 1*). The RJ4 Forceps operates easily and well from the retroflexed position. Excellent biopsies can be obtained even with a tangential approach because of the hinged jaws on the RJ4, which allow excellent positioning of the forceps on the target. Using the turn-and-suction biopsy method, large biopsies were obtained (the GI-nurse described them as "huge"), and these were sent for histological analysis (*Figure 2*). The larger specimens obtain a greater area of mucosa allowing better orientation in the pathology laboratory, and the examination of a greater number of Barrett's glands for the presence of dysplasia.

### Post-Procedure

Histological analysis showed a residual 1 mm focus of intestinal metaplasia with some metaplastic glands under squamous epithelium (*Figure 3 and 3a*). This image shows partially "buried" Barrett's metaplasia beneath squamous epithelium.

Based on the biopsy results, ablation of the residual area of Barrett's epithelium at the esophago-gastric junction was carried out using radiofrequency energy.

## LARGE GASTRIC ULCER FOUND TO BE A GASTRIC CANCER

*Case presented by:* Christian S. Jackson, MD  
 Assistant Professor of Medicine  
 Section of Gastroenterology  
 Jerry L. Pettis VA, Loma Linda VA Hospital  
 Loma Linda, CA

### History

A 60-year-old male with a known history of *Helicobacter pylori* gastritis was initially seen in consultation for evaluation of a microcytic anemia and a drop in hemoglobin. He was recently diagnosed with a CVA and his neurologists were concerned to place him on ASA, thus an upper endoscopy was requested. Patient denied prior NSAID use and was not taking a PPI.

### Procedure

His initial endoscopy revealed a 4 cm clean based ulcer with irregular and friable margins in the mid gastric body (*Figure 1 and 2*). A total of twelve biopsies with Radial Jaw® 3 (RJ3) Biopsy Forceps were taken from the margins of the ulcer. Since it was unclear if he was previously treated for *H.pylori*, biopsies of the antrum and body were taken. The initial biopsies from the ulcer were interpreted as highly atypical cells suggestive of adenocarcinoma. Prior to a surgical oncologic evaluation a diagnosis needed to be confirmed. It was decided that the patient be scheduled for a repeat upper endoscopy and Radial Jaw® 4 (RJ4) Jumbo Biopsy Forceps would be used. Eight biopsies of the ulcer margin were taken (*Figure 3*). The patient subsequently underwent a CT Scan which revealed a hypodense lesion in the left lateral segment. A PET Scan was then performed which showed no evidence for liver or lung metastasis. A biopsy of the lesion revealed that this lesion was a hemangioma.

### Post-Procedure

Once a diagnosis was made, the patient was referred to surgical oncology. He underwent a distal subtotal gastrectomy with D1 lymph node dissection and Roux-en-Y reconstruction. The ability of the RJ4 Jumbo Biopsy Forceps not only allowed for a definitive diagnosis to be made, but helped direct the appropriate intervention for the patient to occur.



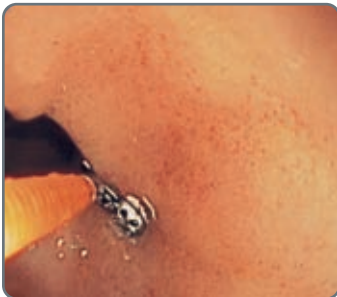
*Figure 1*  
4 cm ulcer base.



*Figure 2*  
4cm ulcer located along the greater curvature of the stomach.



*Figure 3*  
Gastric ulcer after biopsies with RJ4.



Case presented by: Philip J. O'Connor, MD  
Central Maine Gastroenterology Associates, P.A.  
Lewiston, ME

## Gastric Carcinoma

### History

A 62-year-old male who four years previously had a cystectomy for a poorly differential carcinoma of his ureterovesico junction presented with the onset of ascites and elevated CEA in the fluid with malignant cells. He underwent chemotherapy and responded extremely well. He abruptly presented with nausea and vomiting and a flat plate of his abdomen demonstrated apparent gastric outlet obstruction.

### Procedure

Upper GI endoscopy was performed with the therapeutic gastroscope. The obstruction was at the pylorus. It was not typical, however, of neoplasia or ulcer disease. With mild to moderate pressure on the instrument, it easily passed into the second and third portion of the duodenum. The patient was dilated with a #15 to #18 CRE TTS balloon. He then underwent biopsies with the Radial Jaw® 4 (RJ4) Jumbo Forceps.

### Post-Procedure

The patient improved for only twenty-four hours. During that time the biopsies were read and remarkably identified malignant cells at the deepest level of the biopsy specimen (i.e. infiltrating from without). Cells were consistent with anginal pain. The following day a standard duodenal stent was placed with complete resolution of the patient's symptoms.

## Gastric Adenocarcinoma

### History

A 66-year-old woman presented with obstructive jaundice. Imaging studies revealed only a dilated bile duct and haziness in the head of the pancreas. There was no evidence of a mass lesion.

### Procedure

The patient underwent an ERCP which revealed a discolored extrinsic compression of the duodenum, superior to the ampula of Vater. There was no evidence of breakdown of the mucosal lining. Biopsies were performed using the Radial Jaw® 4 Jumbo Forceps. The patient then underwent routine cannulation of her common bile duct and pancreatic duct. The pancreatic duct appeared to be distorted in the head. There was obvious compression of the common bile duct, which was treated with a WALLSTENT® Stent System.

### Post-Procedure

Biopsies were reviewed the following day and adenocarcinoma was noted at the deepest edges of the biopsy.



Case presented by: **Aydamir Alrakawi, MD**  
Hitchcock Clinic  
Manchester, NH

### History

A 53-year-old male with a history of Crohn's colitis for more than 20 years presented for a surveillance colonoscopy. He has been doing well and is having 1-2 bowel movements a day. He is only taking oral mesalamine.

### Procedure

At the time of the colonoscopy, the endoscope was easily advanced to the terminal ileum. This appeared normal. The colonic mucosa appeared normal throughout the colon except for mild erythema in the sigmoid colon. Surveillance biopsies were obtained using Radial Jaw® 4 Jumbo Forceps from every 10 cm at four quadrants (*Figure 1*). Multiple bites were taken at each pass (*Figures 2 and 3*). A total of 32 biopsies were obtained. Biopsies showed mild chronic active inflammation but no evidence of dysplasia noted.

### Post-Procedure

Patient will have a repeat colonoscopy for surveillance in one year. Since exam showed minimal activity, no change in therapy was necessary. The Radial Jaw 4 Jumbo Biopsy Forceps provided samples with a larger surface area and appeared to have the same amount bleeding when compared to my standard forceps. I will continue to use these as my everyday forceps.



*Figure 1*



*Figure 2*



*Figure 3*







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