

## Introduction

- Small intestine neuroendocrine tumors (SI-NETs) are the most common small-intestine malignancy in the United States<sup>1</sup> and the majority arise from the ileum.
- Ileum NETs (i-NETs) have unique features that make preoperative localization and surgical management challenging<sup>2</sup>

### SI-NET Characteristics

Outward Growth  
and Small Size



Fibrosis of Regional  
Lymph Nodes

Unknown Primary

Multifocality

- Several studies have reported the feasibility of a MIS (minimally invasive surgery) approach in select i-NET patients<sup>3,4,5,6</sup>, but the role of MIS in this patient population is still poorly defined
- We previously presented how MIS can successfully and safely accomplish the goals of i-NET surgery, and we now present an update with an expanded cohort of patients

## Methods

- Retrospective review of a SI-NET database at a tertiary-care medical center from 2005-2018.
- Our database had 98 patients with SI-NETs, and 84 with i-NETs that underwent initial resection at our institution were included in this study
- Surgeries were performed with an open or MIS approach, and a hand-assisted device was used during MIS to permit palpation of the small intestine



## Methods (Cont'd)

- Surgeries were performed with the primary goals of a complete oncologic resection, resection of fibrotic adenopathy, and staging
- MIS was initially attempted unless a large liver resection was expected or the patient had contraindications to laparoscopy
- MIS was converted to open surgery when the goals of surgery could not be met safely (usually due to bulky mesenteric adenopathy)
- Statistical analyses were conducted with Stata version 14.2. Chi-squared tests were used for categorical variables, and independent samples t-tests were used for continuous variables. Statistical significance was defined as  $P < 0.05$ , and two-tailed tests were used.

## Results

**TABLE I. Demographics, Operative, and Pathology Data of Minimally Invasive Surgery Compared to Open Surgery**

Variables	MIS (n= 46)	Open (n= 38)	P-value
Age (years, mean ± SD)	60.8 ± 10.2	63.5 ± 12.1	0.28
Female gender, n (%)	25 (54.3)	20 (52.6)	0.88
Type of primary resection, n (%)			0.03*
Small bowel resection	19 (41.3)	25 (65.8)	
Right hemicolectomy	27 (58.7)	13 (34.2)	
Unknown primary tumor, n (%)	27 (58.7)	27 (71.1)	0.24
Multifocal primary tumor, n (%)	21 (45.7)	19 (50.0)	0.69
Lymph nodes			
Positive status, n (%)	41 (89.1)	36 (94.7)	0.15
Number harvested (mean ± SD)	16.3 ± 10.2	13.0 ± 9.5	0.07
Largest tumor size (cm, mean ± SD)	2.35 ± 0.7	2.26 ± 0.7	0.29
Lymphovascular invasion, n (%)	30 (68.2)	19 (61.3)	0.54
Perineural invasion, n (%)	16 (69.6)	10 (85.7)	0.90
Ki67 Index, n (%)			0.24
< 3%	27 (75)	12 (60)	
3-20%	9 (25)	8 (40)	
>20%	0 (0)	0 (0)	
Mitosis Rate (per 10 HPF), n (%)			0.74
< 2%	33 (78.6)	18 (75.0)	
2-20%	9 (21.4)	6 (25.0)	
>20%	0 (0)	0 (0)	
Histologic Grade, n (%)			0.74
G1	30 (69.8)	18 (64.3)	
G2	13 (30.2)	9 (25.0)	
G3	0 (0)	1 (32.1)	

MIS, minimally invasive surgery

\* $P < 0.05$

## Results (Cont'd)

- Of the 84 patients with i-NETs who underwent resection, 38 (45.2%) patients had open surgery and 46 (54.8%) patients had MIS
- 54 (64.2%) patients had primary tumors of unknown origin, and all primary tumors were identified by either MIS (n=21) or open surgery (n = 27)
- 40 (47.6%) patients had multifocal primary tumors that were found with MIS (n=21) or open surgery (n=19)
- Lymph node retrieval was similar between the MIS and open surgery groups (average of 16.3 vs. 13 nodes, respectively)
- 15 patients (24.6%) who initially began with MIS required conversion to open (due to bulky mesenteric adenopathy in 12 patients)



Figure 1. MIS patients requiring conversion to open surgery.

## Conclusions

- The surgical goals of a complete oncologic resection, resection of fibrotic mesenteric adenopathy, and cancer staging can be achieved successfully with MIS in over 50% of patients with i-NET
- MIS can be successful regardless of whether the patient has an unknown primary tumor or multifocal disease, and MIS does not result in fewer lymph nodes retrieved compared to open surgery
- Use of a hand-assisted device enabled identification of unknown and multifocal primary tumors by palpation and is a critical component of MIS for i-NET
- Our study shows that all goals of surgery for i-NETs can be successfully accomplished using an MIS approach

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## References

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