

Introduction

- Endoscopic ultrasound (EUS) - utilized as the most accurate imaging modality for primary tumor staging in esophageal cancer.
- Endoscopic interventions (EMR and ESD) - predicated on early-stage disease diagnosis.
- Studies exist, delineating the correlation of endoscopic and biopsy assessments as evidence for deeper invasion in esophagus cancer in lieu of EUS.
 - This includes tumor size >2cm, the presence of ulceration, lymphovascular invasion, and moderate to poorly differentiated cancers
- Study aim: to convey the role of EUS for early esophageal cancer staging.

Study Design

- Electronic medical record review:
 - ICD-10 codes for esophageal cancer and EUS procedures
 - 102 patients identified
- Inclusion criteria:
 - >18 yo, established diagnosis from biopsies collected during index EGD, EUS conducted prior to any therapeutic intervention such as endoscopic/surgical resection or medical therapies
- Exclusion criteria:
 - EUS not conducted prior to resection, the patient underwent exploratory surgery only, no pathologic diagnosis, and EUS not performed due to a large tumor with a significant obstruction or metastasis
- 50 patients in the study

Statistical Method

- Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and Accuracy of EUS in identifying sub-mucosal invasion were calculated.
- Deeper invasion of tumor on histology was defined as T2 or beyond and endoscopic characteristics significantly associated with deeper invasion were identified by using Fisher exact test or Chi-square test.
- P value <0.05 was considered significant for all comparisons.

Results

Figure 1: Esophageal Cancer TNM Staging

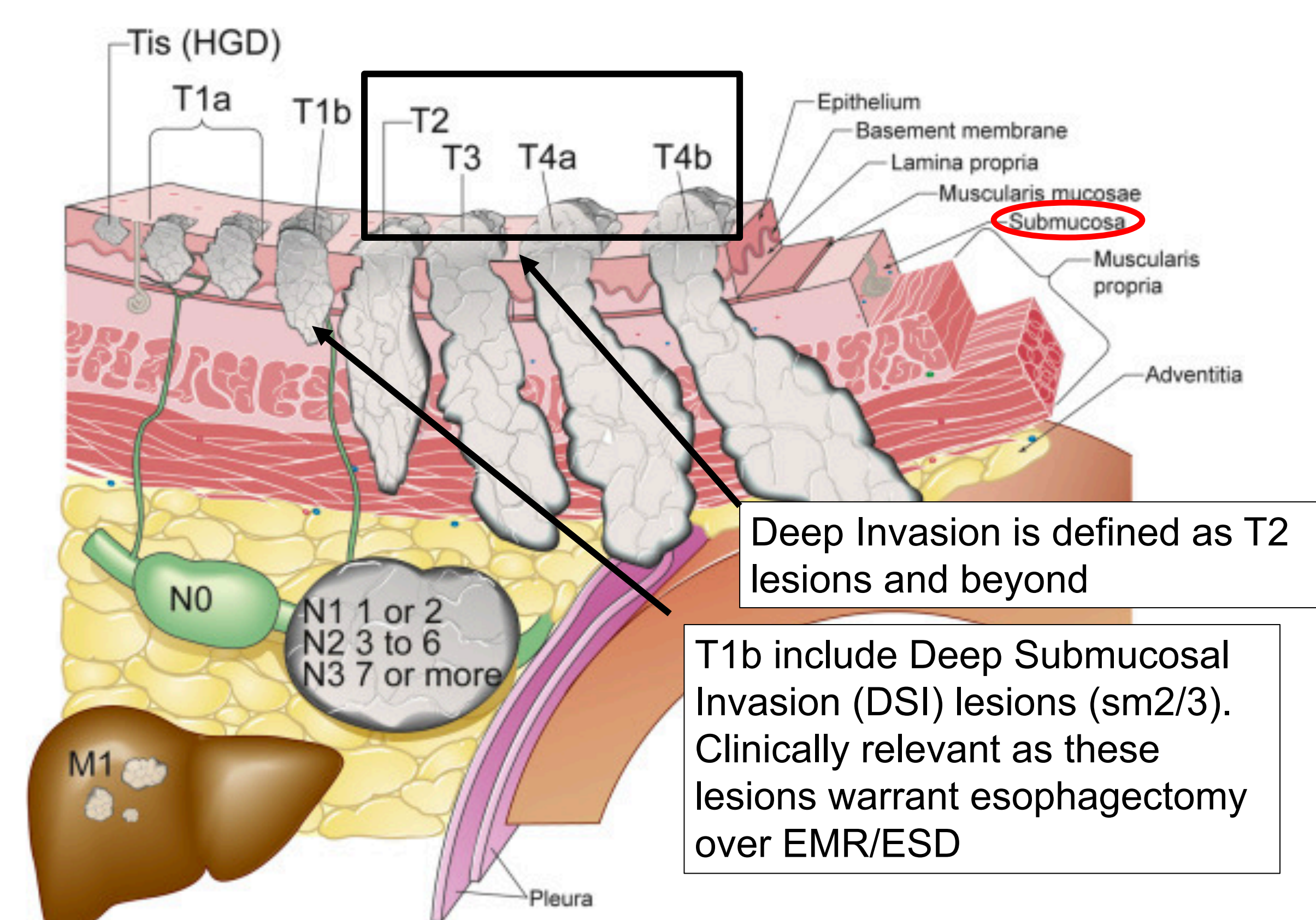


Table 1: Basic Demographics and Clinical Characteristics of All Patients

Variable		Number/Total (n/N)	Percentage (%)
Gender	Males	43/50	86
Ethnicity	Caucasian	42/48	87.5
	Hispanic	1/48	2.1
	Asian	5/48	10.4
Type of Cancer	Adenocarcinoma	45/50	90
	SCC	5/50	10

Figure 2: EUS versus Pathological T-Staging

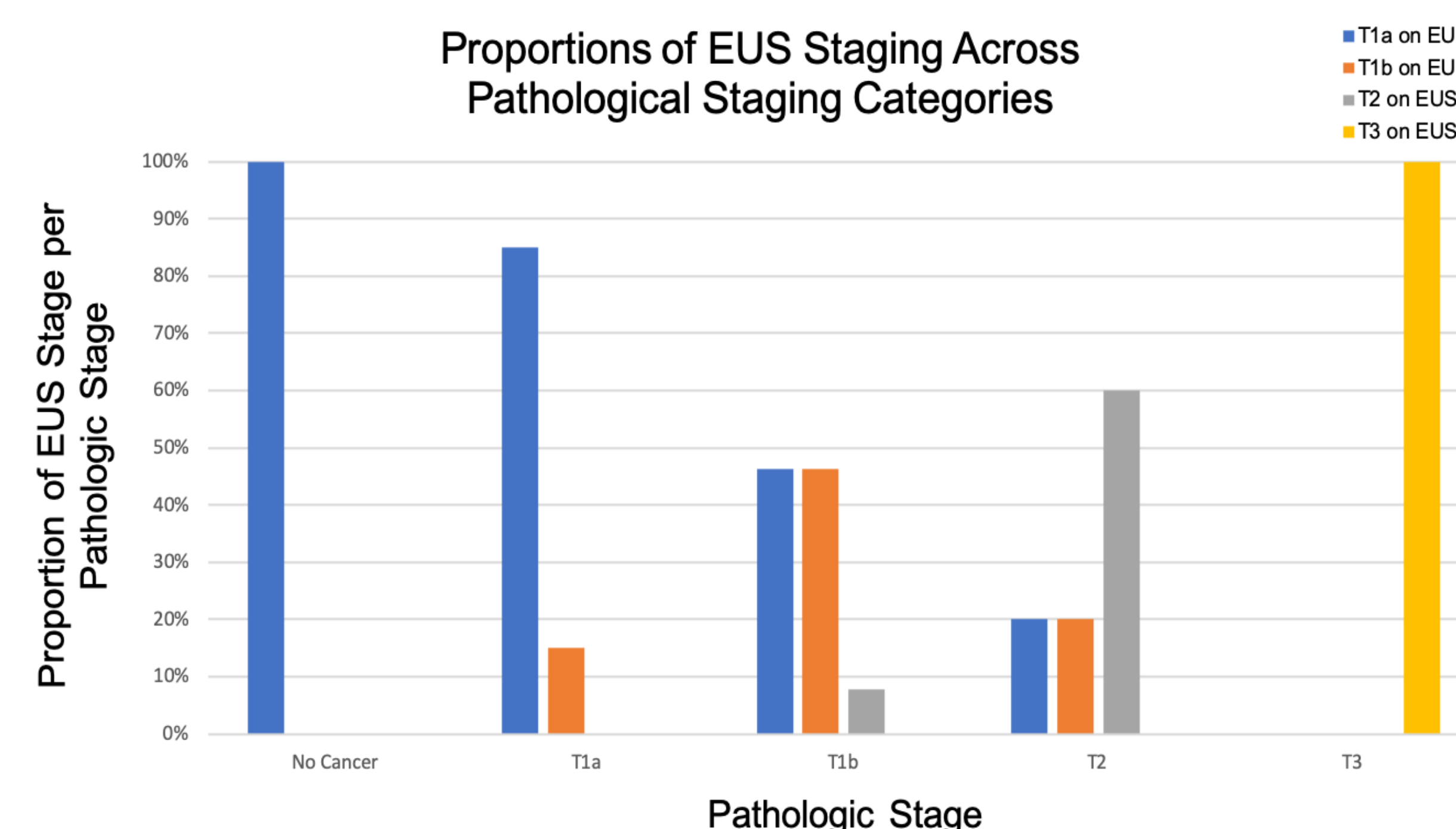


Table 2: Sensitivity, Specificity and Diagnostic Accuracy of EUS in identifying sub-mucosal invasion (T1b)

		Submucosal Invasion on Path		
		Yes (T1b) N=13	No (T1a) N=20	
Submucosal Invasion on EUS	Yes	7	3	PPV 70%
	No	6	17	NPV 73.9%
		Sensitivity 53.80%	Specificity 85%	Accuracy 72.7%

Table 3: Endoscopic parameters significantly associated with deeper invasion of esophageal tumor on pathology (T2 and beyond)

Endoscopic Parameters	Deeper Invasion on Pathology		P-value
	Yes (T2 and beyond) (%)	No (T1a and T1b) (%)	
Tumor Size >2cm on Visual Inspection	81.2	18.8	<0.01
Presence of Ulceration	0.0	42.4	<0.01
EUS Parameter			
'Notable' para-esophageal lymph nodes on EUS*	81.2	33.3	<0.001
Degree of Differentiation			
Well Differentiated	16.7	53.6	<0.01
Moderately Differentiated	50	46.4	
Poorly Differentiated	33.3	0	

*'Notable' node includes nodes not diagnostic by EUS criteria

Table 4: EUS concordance with endoscopic findings suggesting superficial cancer.

Endoscopic Parameter(s) Associated with Superficial Cancer	Cases of EUS revealing superficial cancer (EMR or ESD performed)	Cases of EUS revealing DSI or beyond (Esophagectomy performed)	Frequency EUS changes management (%)
Tumor size < 2 cm	28	2	6.7
Lack of Ulceration	26	9	25.7
Tumor size < 2 cm + Lack of Ulceration	14	1	6.7

Summary

- In staging T1b lesions, EUS was reasonably specific (0.85) in ruling out sub-mucosal invasion. Relatively poor sensitivity (0.54) in identifying T1b.
- Overall accuracy of EUS in staging T1b lesions in our study was 72.7%.
- Endoscopic parameter of tumor size >2cm was associated with deep invasion (T2 and beyond)
- EUS parameter of notable para-esophageal lymph was associated with deep invasion.
- Moderate to poorly differentiated cancers on pathology were associated with deep invasion
- When known endoscopic signs of deep invasion were not present, EUS altered management from EMR/ESD to Esophagectomy in <7% of cases.

Conclusions/Further Study

- EUS is accurate in staging deep invasive cancers (T2 or beyond) and reliably excludes deep invasive cancers from T1 lesions.
- EUS does not accurately distinguish between T1a and T1b lesions.
- Reinforced that tumor size > 2 cm, lymph node involvement and poor differentiation are endoscopic parameters associated with deep invasion (T2 or beyond)
- EUS infrequently changes the outcome in the patients based on prior endoscopic features.
- While EUS may improve accuracy, our data indicates that it rarely finds DSI to warrant esophagectomy over EMR/ESD when endoscopic features suggest a superficial cancer (T1a or more superficial).

References

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- Sun F, Chen T, Han J, Ye P, Hu J. Staging accuracy of endoscopic ultrasound for esophageal cancer after neoadjuvant chemotherapy: A meta-analysis and systematic review. *Dis Esophagus*. 2015;28:757-771.
- Pouw RE, Helder N, Alvarez HL, et al. Do we still need EUS in work up of patients with early esophageal neoplasia? A retrospective analysis of 131 cases. *Gastrointestinal Endosc*. 2011; 73 (4): 662. Epub 2011 Jan 26