

BACKGROUND

Introduction:

Sarcopenia, or skeletal muscle wasting impacts between 48-58% of head and neck cancer (HNC) patients and has been associated with adverse outcomes including post-operative complications, decreased disease-free survival, increased post-radiation toxicity, and worse overall survival^[1,2]. Within HNC patients, sarcopenia is currently measured as a clinical estimation and rarely tracked over time. This study utilizes head and neck CT scans to objectively measure temporal changes in skeletal muscle mass among patients undergoing transoral robotic surgery (TORS) with or without adjuvant therapy for treatment of oropharyngeal squamous cell carcinoma (OPSCC).

Hypotheses:

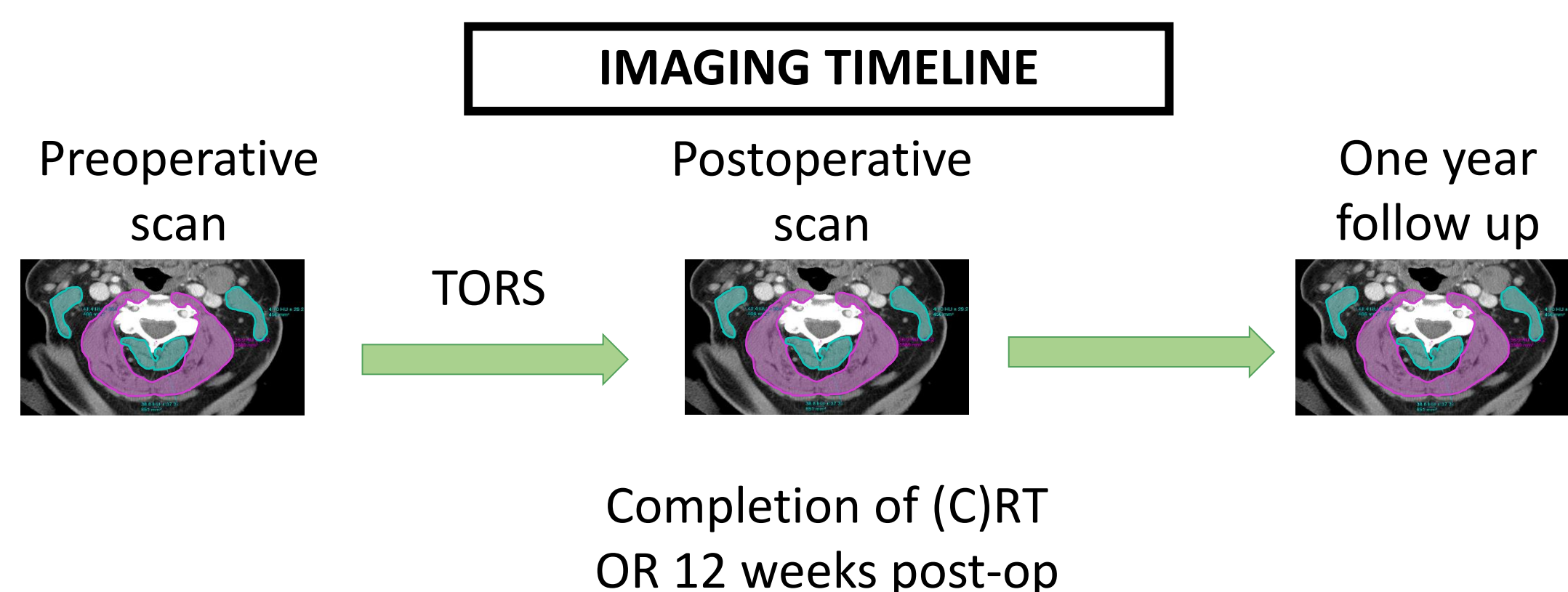
We hypothesized that patients undergoing TORS with adjuvant therapy would experience a greater decrease in skeletal muscle mass compared to the TORS only group.

METHODS

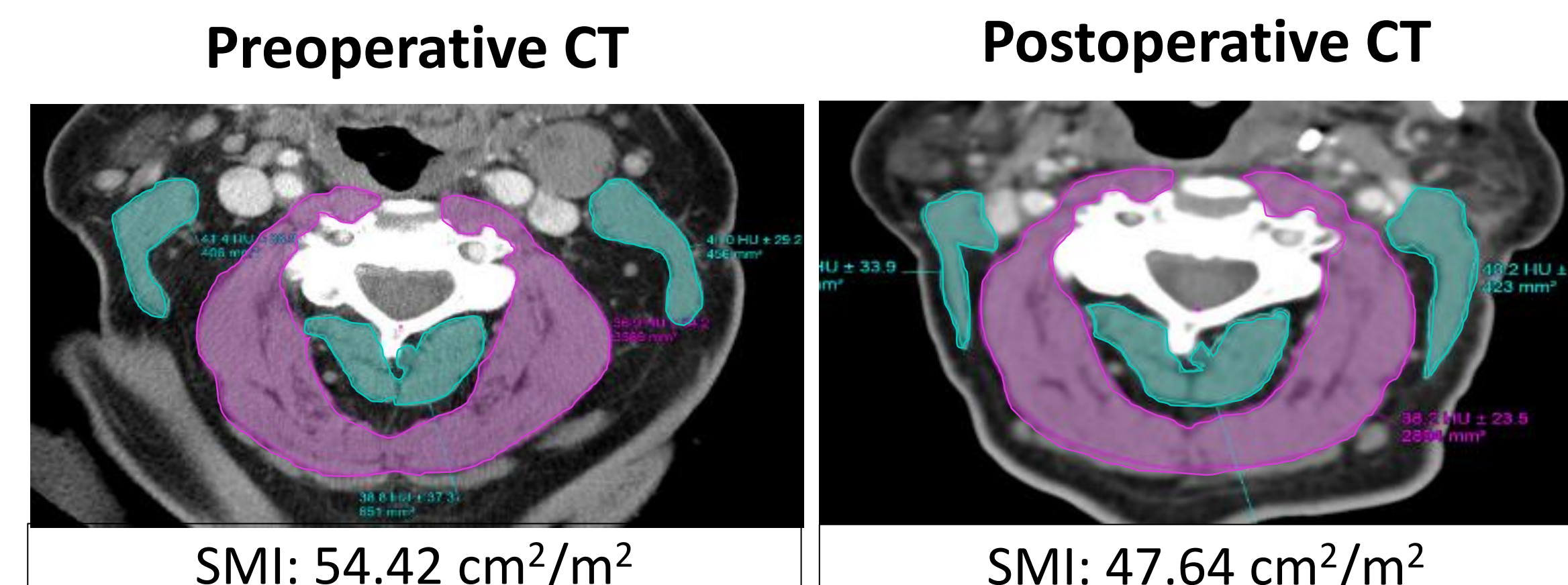
Retrospective cohort of 121 patients undergoing TORS for OPSCC. The Skeletal Muscle Index (SMI) was calculated by measuring the cross-sectional area of paravertebral and sternocleidomastoid muscles at the C3 level as previously described^[3].

SMI scores were measured by two independent raters. Interrater reliability was calculated using the interclass correlation coefficient. Student's T-test for paired samples was used to compare change in SMI for individual patients over time. Independent T-tests and analysis of variance (ANOVA) was used to compare means between treatment groups.

Comorbidities were grouped using the Adult Comorbidities Evaluation - 27 scores.



RESULTS



Sarcopenia cutoffs: **34.4 cm²/m²** for females and **45.4 cm²/m²** for males.

Patient Characteristics by Pre-Operative Sarcopenia Status				
	Total (n = 121)	Sarcopenic (n = 34)	Non-sarcopenic (n = 87)	p-value
Gender				
Male	108 (89%)	28 (82%)	80 (92%)	
Female	13 (11%)	6 (18%)	7 (8%)	0.1878
Pre-Operative Age	61.2 (22 - 82)	65.7 (44-82)	59.2 (22-75)	<0.0001
Pre-Operative BMI	29.1 (6.13)	24.1 (2.83)	31.0 (5.98)	<0.0001
HPV Negative	10 (8%)	3 (9%)	7 (8%)	1.000
Comorbidities				
None-Mild	81 (66%)	17 (50%)	63 (72%)	
Moderate-Severe	41 (34%)	17 (50%)	24 (28%)	0.0315
Smoking				
Current or Former	76 (63%)	21 (62%)	55 (63%)	
Never	45 (37%)	13 (38%)	32 (37%)	1.000
Alcohol Use				
Current or Former	107 (88%)	28 (82%)	79 (91%)	
Never	14 (12%)	6 (18%)	8 (9%)	0.2135
AJCC Staging				
I - II	107 (88%)	28 (82%)	79 (91%)	
III - V	13 (11%)	5 (15%)	8 (9%)	0.3423
Missing	1 (1%)	1 (3%)	0 (0%)	
Treatment Modality				
Surgery Only	30 (25%)	12 (36%)	18 (21%)	
Surgery + Radiation	52 (43%)	11 (32%)	41 (47%)	
Surgery + Chemoradiation	39 (32%)	11 (32%)	28 (32%)	0.1882
% Change in SMI				
Post-Op	-5.23 (6.83)	-2.67 (5.64)	-6.24 (7.00)	0.009

Independent Evaluator Interrater Reliability Measures

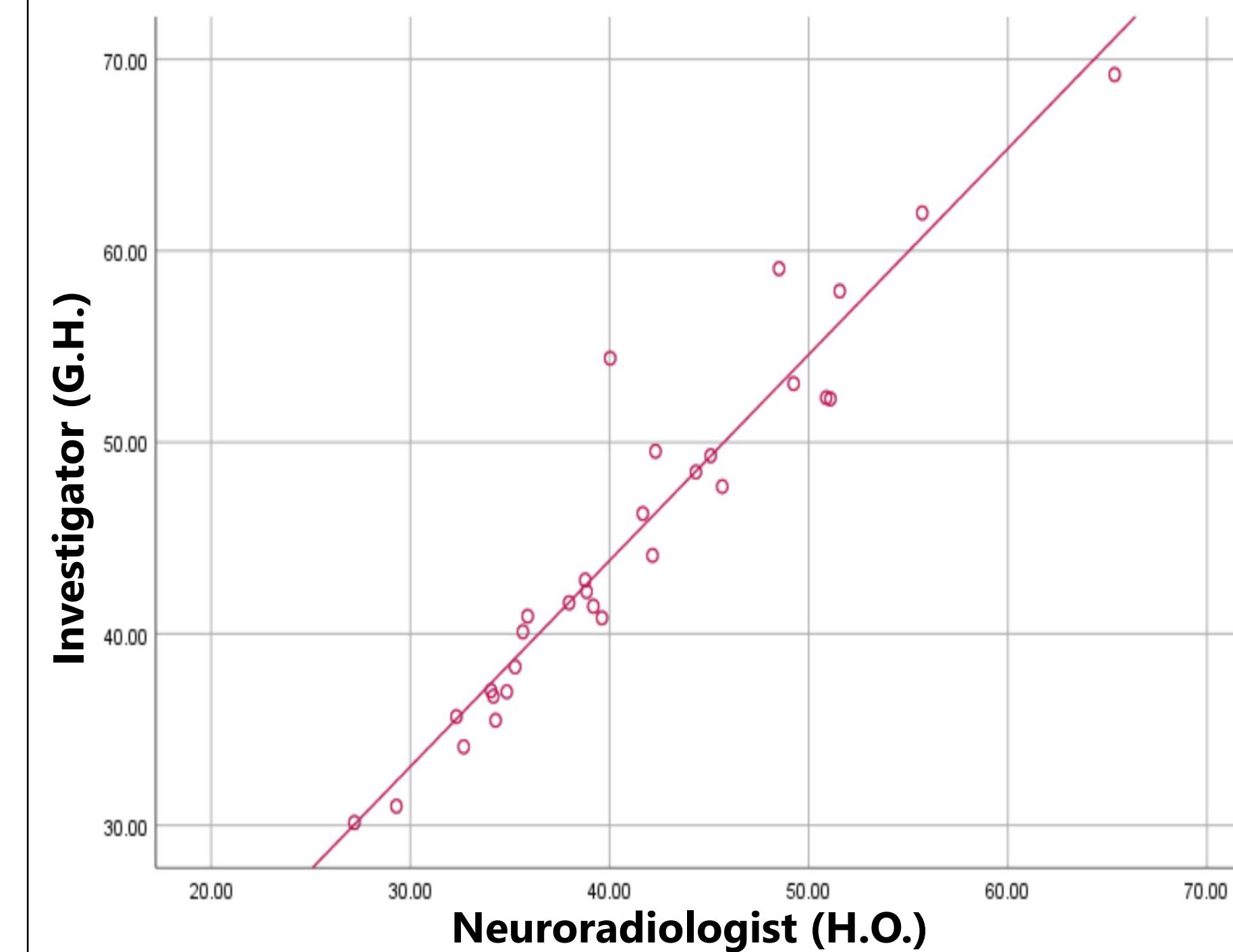


Figure 1: All scans were measured by two independent raters including a medical student (GH), and a neuroradiologist (HO). ICC of average measures was 0.930 ($p < 0.0001$), demonstrating excellent agreement between raters.

Percent change in SMI by treatment group

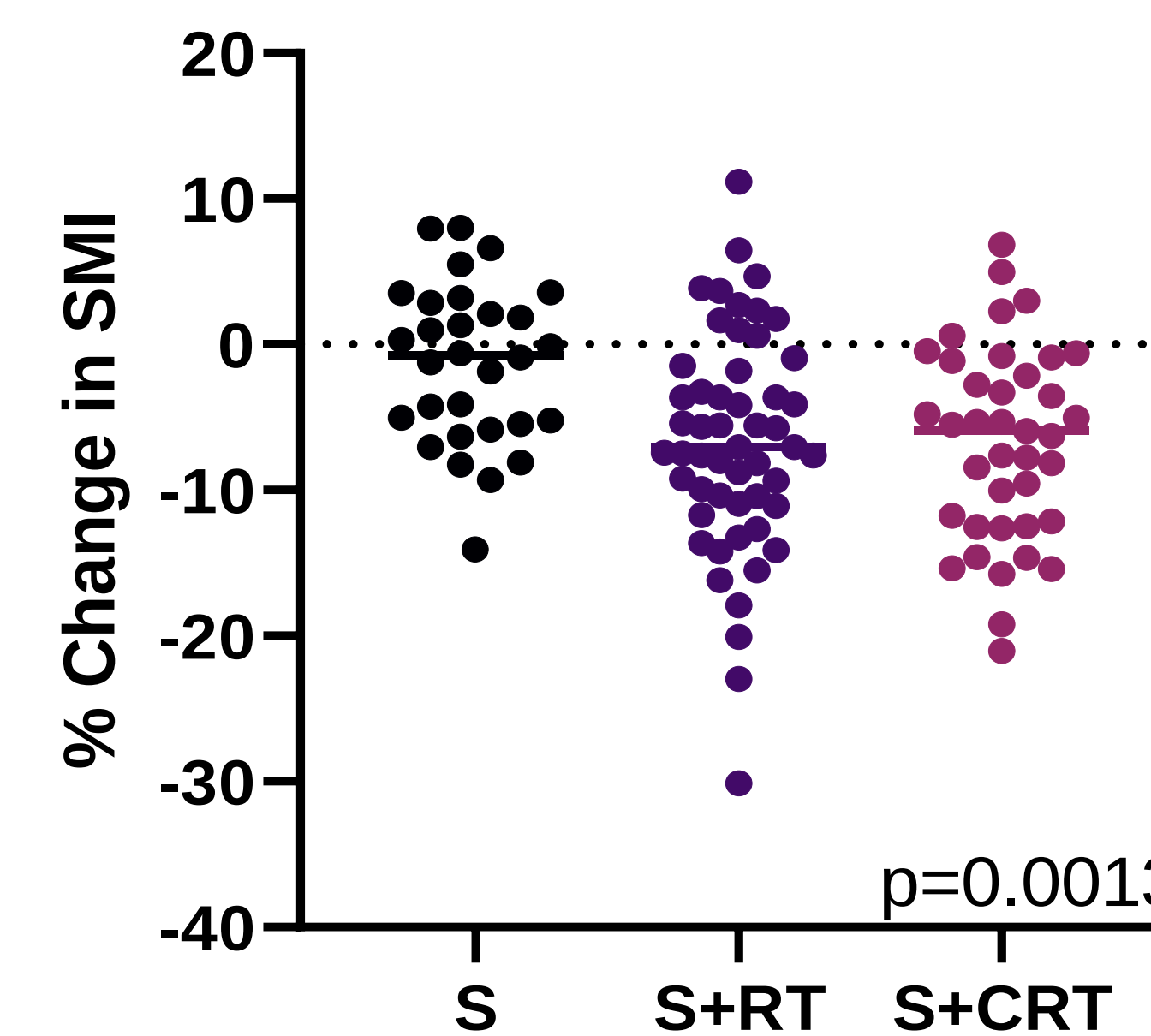


Figure 2: Patients undergoing surgery alone (S) experienced minimal change in SMI compared to those undergoing adjuvant radiotherapy (S+RT) alone or in combination with chemotherapy (CRT). ANOVA.

Baseline BMI is predictive of SMI following adjuvant therapy

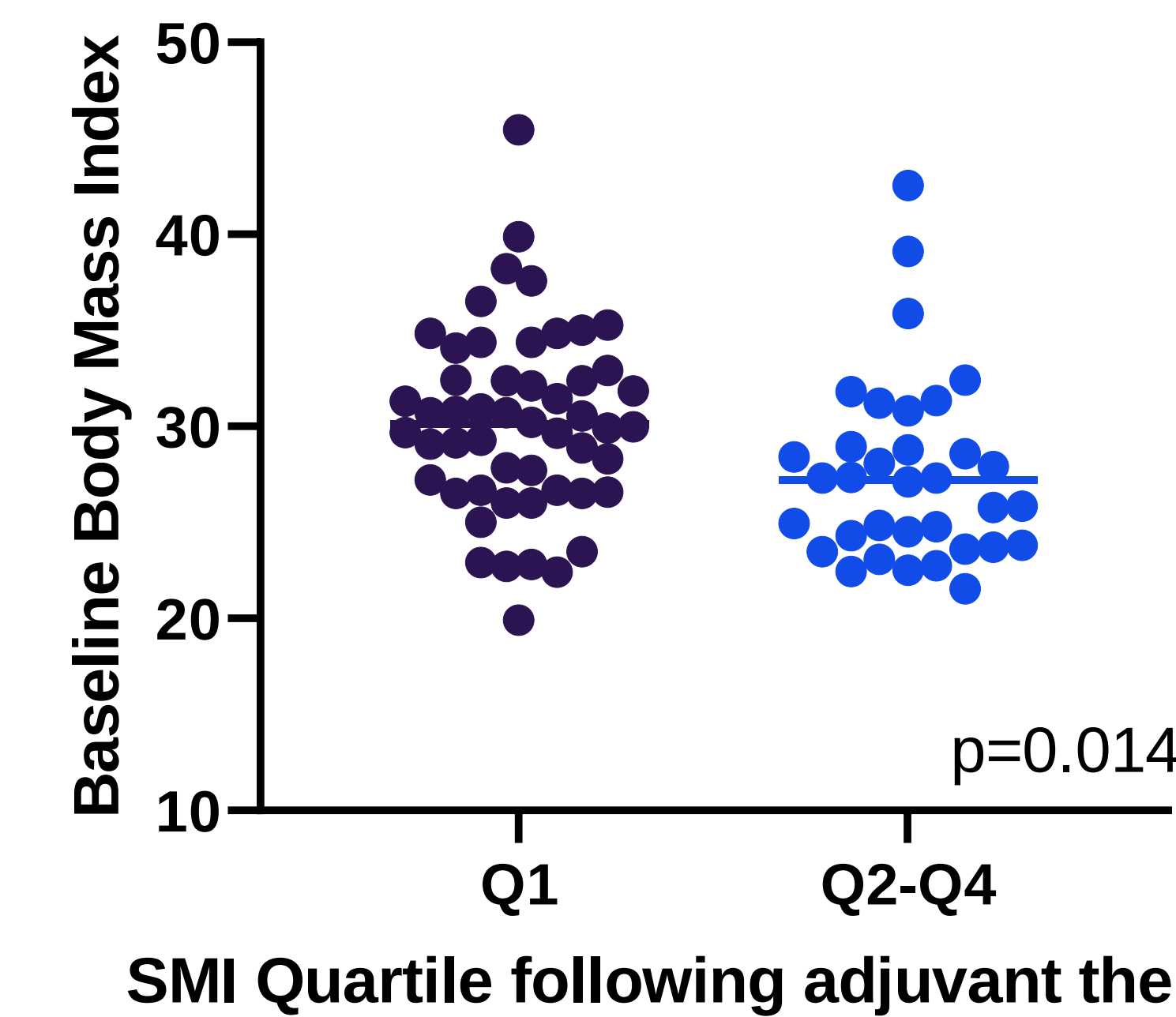


Figure 3: Patients with the lowest SMI scores following adjuvant therapy (Q1) had a higher BMI at baseline, while patients presenting with lower baseline BMIs had a modest loss. Mean BMI at presentation was 30.2 and 27.6, for the 1st quartile and 2nd - 4th quartiles of posttreatment SMI, respectively. Students T.

CONCLUSIONS

1. This study highlights that Head and Neck CT-based measurements may be a powerful and accessible tool for longitudinal assessment of SMI in HNC patients.
2. Patients meeting pre-operative criteria for sarcopenia were more likely to be older and have more medical comorbidities. Pre-operative sarcopenia was not, however, associated with any differences in tumor stage, smoking/alcohol/HPV status, or treatment modality received.
3. Changes in SMI vary by treatment type; those undergoing TORS alone did not demonstrate significant muscle mass change, while those undergoing TORS + (chemo)radiation saw significant decline. This is likely an effect of radiation and may be useful as a quantitative measure of radiation morbidity in deintensification trials.

CONCLUSIONS

4. Patients with low body mass tended to see a percent smaller decline in SMI with treatment, likely due to preexisting reduced muscle mass.

Study Limitations:

Age-related muscle loss may contribute to our findings, and we were not able to control for this.

Additionally, the local toxic effects of radiation on cervical muscles may vary depending on fields of radiation. Practices may differ from one treatment center to another.

Only one-third of patients had adequate 1-year post-treatment scans; long term follow up data is needed to evaluate longitudinal SMI scores as a predictor of survival.

ACKNOWLEDGMENTS

This research was conducted as part of the Washington University School of Medicine Summer Research Program (WUSM SRP) and was supported by the DeNardo Scholarship Fellowship. The authors would like to thank the Office of Medical Student Research (OMSR) for their support.

REFERENCES

References:

- [1] Wong A, et al. *Laryngoscope*. 2020
- [2] Achim V, et al. *JAMA Otolaryngol Head Neck Surg*. 2017;143:1159-65
- [3] Swartz JE, et al. *Oral Oncol*. 2016;62:28-33.

CONTACT

Gopika Hari, BS, BA
MD Candidate
Washington University School of Medicine
520 S Euclid Ave, St. Louis, MO 63110
hari.g@wustl.edu