

Introduction and Objectives

Complications after total laryngectomy are well-described in the literature. Red blood cell distribution width (RDW) is an inexpensive laboratory test that is easily accessible and routinely collected in hospital patients. Elevated RDW values have been associated with increased all-cause and disease-specific morbidity and mortality in patients with malignancies and in those with non-malignant systemic diseases, including heart failure and chronic obstructive pulmonary disease. RDW has also been identified as a potential predictor of post-operative complications and mortality following a variety of surgical procedures. Correlation between RDW and post-operative outcomes following otolaryngologic procedures is limited and warrants further evaluation. Few studies have evaluated the association of RDW with laryngeal cancer. The purpose of this study was to examine the association between RDW and adverse post-operative outcomes among patients with a history of squamous cell carcinoma of the larynx who underwent either primary or salvage total laryngectomy.

Table 1. Characteristics of the study population.

	Total sample, N=177		Red blood cell width distribution			
	n*	%	<14.5, n=135		≥14.5, n=42	
			n	%	n	%
Age, yr.						
<65	120	67.8	92	68.15	28	66.67
≥65	57	32.2	43	31.85	14	33.33
Sex						
Male	132	74.58	105	77.78	27	64.29
Female	45	25.42	30	22.22	15	35.71
Body mass index, kg/m ²						
<25	80	55.56	58	54.72	22	57.89
≥25	64	44.44	48	45.28	16	42.11
Site						
Supraglottis	106	59.89	75	55.56	31	73.81
Glottis	36	20.34	33	24.44	3	7.14
Transglottis	35	19.77	27	20	8	19.05
Perineural invasion						
Absent	88	54.66	66	54.55	22	55
Present	73	45.34	55	45.45	18	45
Lymphovascular invasion						
Absent	73	45.06	53	43.44	20	50
Present	89	54.94	69	56.56	20	50
Received adjuvant radiotherapy						
No	49	27.68	35	25.93	14	33.33
Yes	128	72.32	100	74.07	28	66.67

Methods

Patients who underwent primary or salvage total laryngectomy after failure of primary RT or CRT for biopsy-proven squamous cell carcinoma (SCC) of the glottis, supraglottis, or transglottis between 2000-2015 were included in the study.

Figure 1: Association of recurrence-free survival with red blood cell distribution width, $p=0.95$.

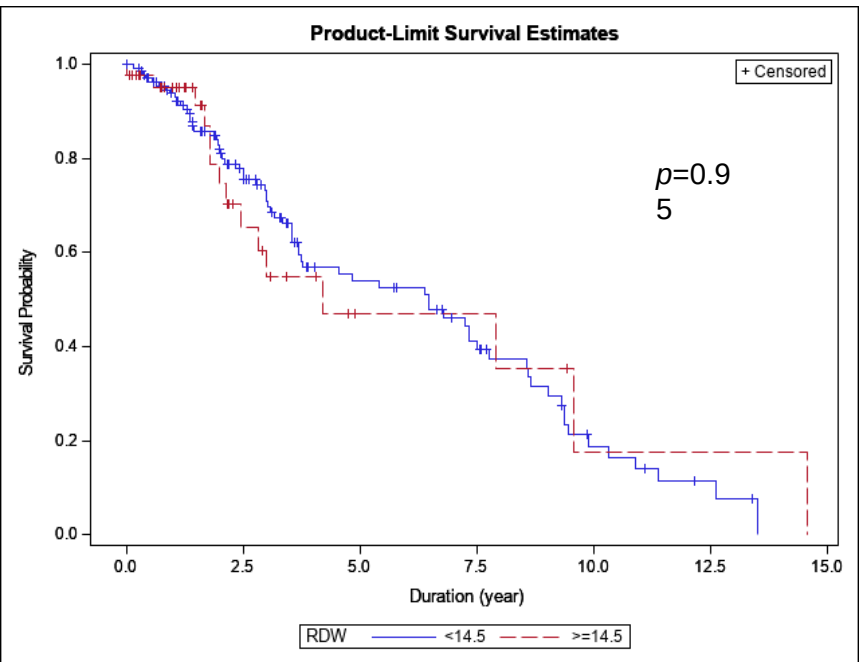


Table 2. Risk of postoperative and delayed complications with red blood cell width distribution.

Type of complication		Red cell width distribution				p ^a
		<14.5, n=135		≥14.5, n=42		
		n*	%	n	%	
Postoperative complications	One or postoperative complications					
	No	92	68.15	21	50	0.043
	Yes	43	31.85	21	50	
	Mucocutaneous fistula					
	No	116	85.93	35	83.33	0.63
	Yes	19	14.07	7	16.67	
	Wound infection					
	No	126	93.33	40	95.24	>0.99
	Yes	9	6.67	2	4.76	
	Wound dehiscence					
	No	121	89.63	38	90.48	>0.99
	Yes	14	10.37	4	9.52	
	Soft tissue necrosis					
	No	131	97.04	40	95.24	0.63
	Yes	4	2.96	2	4.76	
	Stoma complication					
	No	133	98.52	40	95.24	0.24
	Yes	2	1.48	2	4.76	
	Bleeding					
	No	131	97.04	39	92.86	0.36
	Yes	4	2.96	3	7.14	
	Chyle leak					
	No	131	97.04	40	95.24	0.63
	Yes	4	2.96	2	4.76	
	Sepsis					
	No	135	100	42	100	NA
	Yes	0	0	0	0	
TEP related						
No	135	100	42	100	NA	
Yes	0	0	0	0		
Flap related						
No	133	98.52	40	95.24	0.24	
Yes	2	1.48	2	4.76		
Other complications						
No	133	98.52	41	97.62	0.56	
Yes	2	1.48	1	2.38		
Systematic complications						
No	126	93.33	30	71.43	<0.001	
Yes	9	6.67	12	28.57		

Discussion

The overall incidence of at least one postoperative early complication was high (36%), consistent with previous reports. Moreover, among patients with an elevated RDW, complications occurred more frequently (50.0% versus 31.9%, $p = 0.043$). Although pharyngocutaneous fistula was the single most common early complication in both RDW groups, there was no significant difference in incidence of surgery-specific complications, either in the immediate postoperative period (within 30 days) or delayed. In contrast, systemic early complications not specific to laryngectomy were associated with an elevated RDW. These included deep venous thrombosis, cardiovascular events, pneumonia, and failure to wean from ventilation. These findings are consistent with previous reports, specifically, elevated RDW has been associated with venous thrombosis, increased mortality in pneumonia patients, lower cardiopulmonary fitness, and fewer ventilator-free days in critically ill patients. Despite the increase in non-specific adverse systemic events, RDW did not appear to impact recurrence-free survival in laryngectomy patients.

Limited data is available regarding the association of RDW with laryngeal cancer in patients who underwent total laryngectomy. Bozkurt et al. found that an elevated RDW was associated with worse disease-free survival in patients with a history of laryngeal cancer. The patient population included a variety of extirpation procedures for laryngeal cancer, including total laryngectomy but also cordectomy. These patients had a wide variety of T stages, with 31% being T1. Hsueh et al. analyzed male patients who underwent partial or total laryngectomy and showed patients with elevated pre-operative RDW had worse clinical outcomes. Both of these studies had variable cut-off values for elevated RDW and key differences in patient cohorts compared to the current study, thus direct comparisons cannot be made between these studies and the current study. Similar to these discrepancies, conflicting studies have reported on RDW with respect to oral cavity cancer patients. In an analysis of 374 patients with oral cavity cancer, RDW was found to have no prognostic value on disease-specific survival or recurrence. Conversely, in a separate analysis of 236 oral cavity cancer patients, elevated RDW at diagnosis was associated with worse overall survival in multivariate analysis. Thus, multiple subsites in the head and neck have variable conclusions regarding the prognostic value of RDW with respect to disease control and overall survival. Prospective trials are warranted to further elucidate any potential prognostic value for RDW in head and neck cancer patients.