

Predictors of Survival Following Carotid Blowout Syndrome

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Abstract

Objectives: Carotid blowout syndrome (CBS) is a rare, life-threatening complication for patients with head and neck cancer (HNC). The primary objective was to identify factors associated with survival following CBS.

Materials and Methods: A retrospective analysis of HNC patients treated at a single tertiary care hospital with CBS between 2016 to 2020 was performed. A multivariate Cox proportional-hazards model identified independent predictors of survival. A *p* value of < 0.05 was considered significant. Kaplan-Meier survival analysis was performed.

Results: 45 patients were identified. The majority were male (80.0%) with a mean age of 64 years at time of blowout. Oropharynx was the most common primary site (48.9%) and 73.3% of patients had stage IV disease. 35 (77.7%) patients had active tumor at time of CBS. 80.0% of patients previously received RT with a mean total dose of 62.5 ± 14.8 Gy. Threatened/type I, impending/type II, and acute/type III CBS occurred in 6.7%, 62.2%, and 31.1% of cases, respectively. Patients underwent either embolization (80.0%) or endovascular stent placement (20.0%). The 30-day and 1-year OS rates were 70.1% and 32.0%, respectively. Primary oropharyngeal tumors (adjusted hazard ratio [aHR], 4.31 [1.30-15.15 95% confidence interval]), active tumor at time of CBS (aHR 8.21 [2.10-54.95]), ICA or CCA rupture (aHR 5.81 [1.63-21.50]), and acute/type III CBS (aHR 2.98 [1.08-7.98]) were independent predictors of survival.

Conclusion: Primary oropharyngeal tumors, active tumor at time of CBS, ICA or CCA rupture, and acute/type III hemorrhage were independent predictors of survival. Multidisciplinary management and prompt intervention at experienced treatment centers may improve outcomes following CBS.

Introduction

- CBS is a devastating complication of HNC
- CBS incidence: 2.9 - 4.5%; mortality approx. 80%
- CBS classification: threatened (type I), impending (type II), or acute hemorrhage (type III)
- Risk factors: total RT dose ≥ 70 Gy, radical neck dissection, wound infection/fistula, oropharyngeal tumors
- Management includes endovascular procedures (e.g. stenting/coiling) and open surgical approach
- Predictors of survival poorly understood

Results

Characteristics	Number of Patients (%)
Age	
> 60	19 (42.2%)
≤ 60	26 (57.8%)
Sex	
Male	36 (80.0%)
Female	9 (20.0%)
BMI	
< 20	31 (68.9%)
≥ 20	14 (31.3%)
Primary Tumor Site	
Oral Cavity	5 (11.1%)
Oropharynx	22 (48.9%)
Larynx	8 (17.8%)
Hypopharynx	0 (0.0%)
Simonasal	4 (8.9%)
Thyroid	2 (4.4%)
Other	4 (8.9%)
Treatment History	
None/observation	2 (4.4%)
Surgery	1 (2.2%)
Surgery + RT	5 (11.1%)
Surgery + CRT	18 (40.0%)
RT	1 (2.2%)
CRT	18 (40.0%)

Table 1: Baseline Patient Characteristics

Patient Variable	Univariate		Multivariate	
	Adjusted Hazard Ratio (95% CI)	<i>p</i> value	Adjusted Hazard Ratio (95% CI)	<i>p</i> value
Sex				
Male	[Ref]			
Female	1.35 (0.52-3.05)	0.51		
Age, years				
≤ 60	[Ref]			
> 60	0.68 (0.31-1.40)	0.30		
BMI, kg/M²				
≥ 20	[Ref]			
< 20	1.16 (0.53-2.41)	0.70		
Primary Tumor Site				
Non-oropharynx	[Ref]			
Oropharynx	0.85 (0.40-1.78)	0.66	4.31 (1.30-15.15)	0.001
Charlson/Deyo Comorbidity Score				
< 2	[Ref]			
≥ 2	1.40 (0.64-2.90)	0.38		
Treatment History for Primary				
No surgery	[Ref]			
Surgery	0.57 (0.27-1.20)	0.14		
Current Tumor at time of CBS				
No	[Ref]			
Yes	5.13 (1.79-21.63)	0.001	8.21 (2.10-54.95)	0.001
Total Radiation Dose, Gy				
< 70	[Ref]			
≥ 70	1.26 (0.56-1.78)	0.57	0.91 (0.36-2.42)	0.859
Rupture Type/Grade				
I/II (Impending/Sentinel)	[Ref]			
III (Acute)	2.43 (1.10-5.12)	0.029	2.98 (1.08-7.98)	0.036
Rupture Site				
ECA or its branches	[Ref]			
CCA/ICA	3.60 (1.51-8.05)	0.005	5.81 (1.62-21.50)	0.007
Pre-Existing Tracheostomy at time of CBS				
No	[Ref]			
Yes	2.03 (0.94-4.20)	0.069		
Admission Hemoglobin, g/dL				
≥ 10	[Ref]			
< 10	1.03 (0.51-2.13)	0.92		

Table 2: Univariate & Multivariate Analyses of Prognostic Factors

Characteristics	Number of Patients (%)
Neck Dissection?	
Yes	12 (26.7%)
No	33 (73.3%)
RT Total Dose	
< 70 Gy	21 (46.7%)
≥ 70 Gy	15 (33.3%)
Current Chemo at Time of CBS	
Yes	21 (46.7%)
No	15 (33.3%)
Time to Intervention	
<2 hour	8 (17.8%)
2-12 hours	14 (31.1%)
>12 hours	23 (51.1%)
Rupture Site	
CCA	7 (15.6%)
ECA	9 (20.0%)
Branch of ECA	27 (60.0%)
ICA	2 (4.4%)
Rupture Type/Grade	
Type I/Threatened	3 (6.7%)
Type II/Impending/Sentinel	28 (62.2%)
Type III/Acute	14 (31.1%)

(continued)

Characteristics	Number of Patients (%)
Current Tumor at Time of CBS?	
Yes	35 (77.8%)
No	10 (22.2%)
Pre-existing Trach at Time of CBS?	
Yes	15 (33.3%)
No	30 (66.7%)
Admission Hgb	
< 10	24 (53.3%)
≥ 10	21 (46.7%)
Rupture Management	
Embolization	36 (80.0%)
Stent	9 (20.0%)
Re-bleeding?	
No	33 (73.3%)
Yes	12 (26.7%)
Mortality within 30 Days?	
No	32 (71.1%)
Yes	13 (28.9%)

(continued)

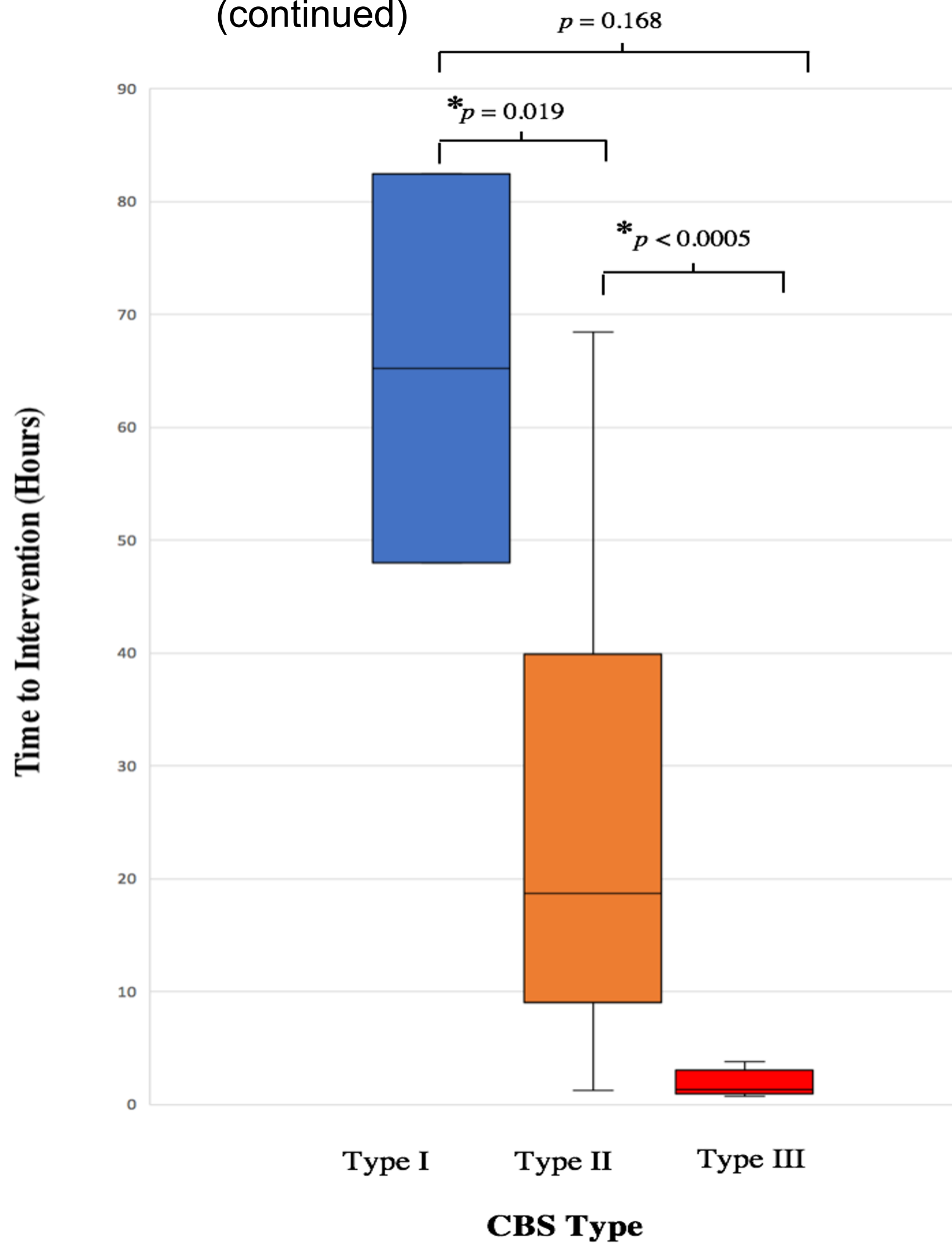
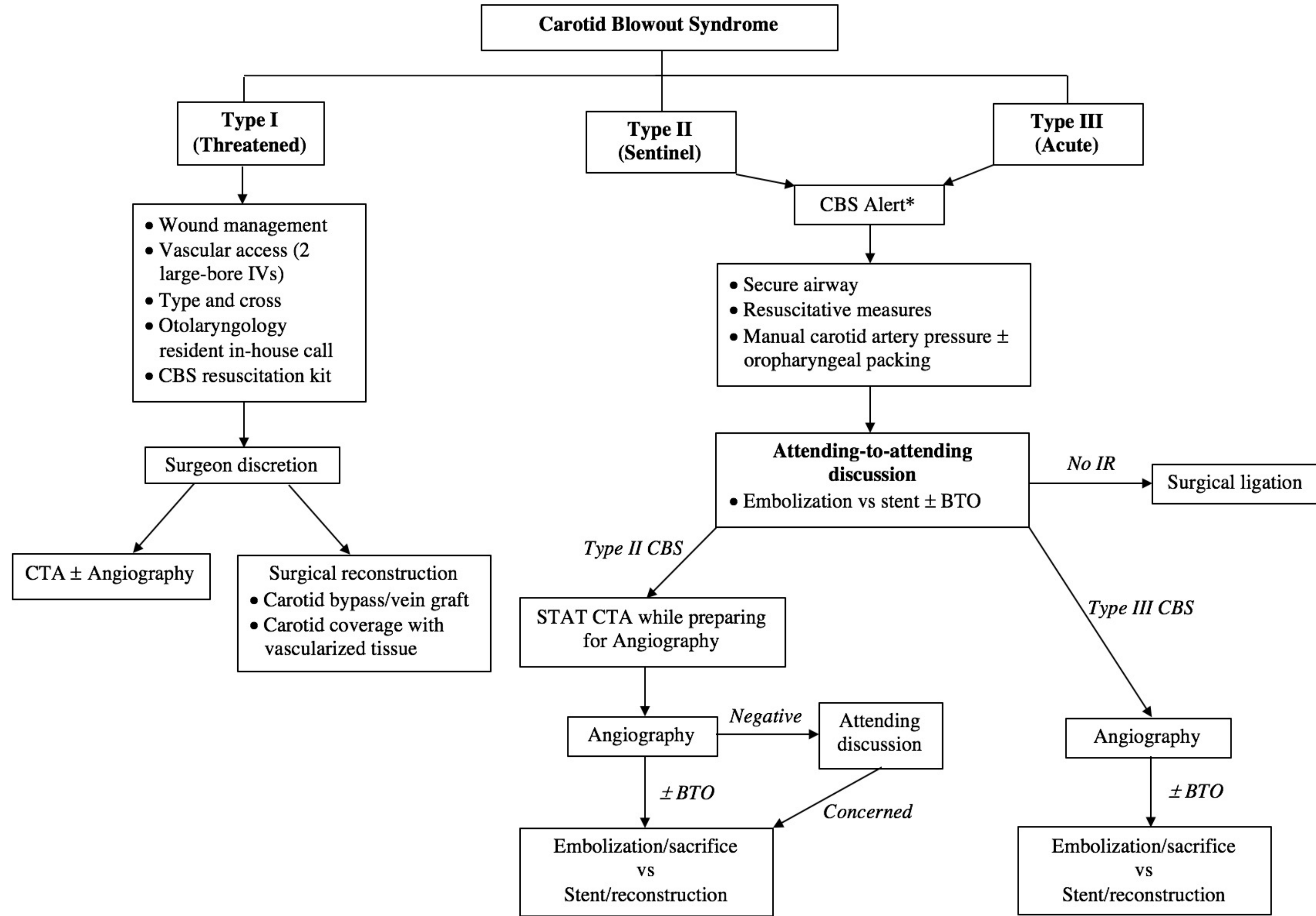


Figure 1: Time to Intervention by CBS Type

CBS Treatment Algorithm



Discussion

- Oropharyngeal tumors, active tumor, ICA/CCA rupture, & acute/type III hemorrhage were independent predictors of survival
- Overall complication rate: 15.6% (3 cardiac arrest, 2 respiratory failure, 1 pneumonia, 1 stroke)
- 30-day survival: 70.1%; 1-year OS: 32.0%
- Majority of patients with Type III (acute) bleeds undergo definitive management in less than 2 hours from presentation
- Improved complication and survival rates suggest benefit of institutional CBS algorithm
- Time to intervention stratified by CBS type was not significant, suggests bleed severity (rather than time) portends worse prognosis

Limitations

- Small patient numbers; retrospective review
- Attempted to assess outcomes pre- & post-algorithm; however, limited reliable data prior to 2016 (e.g. lack of ICD-9/10 codes)
- Prospective studies necessary to compare endovascular techniques

Conclusions

- Tumor subsite, active tumor, bleed severity, and bleed location predict patient survival
- Multidisciplinary teams, experienced treatment centers, and prompt management may improve CBS outcomes
- Established algorithm may be implemented to improve survival

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