

Airway Involvement of Severe Burns in Children

Introduction

Children admitted to the pediatric intensive care unit (PICU) for burns commonly present with airway involvement, often necessitating bronchoscopy. Prompt identification of airway involvement in patients with burns is imperative as airway edema can evolve up to 48 hours after insult. [1]

There is a paucity of research comparing the incidence of inhalational injury among children suffering head and neck (HN) burns. [2,3]

In this study, we assess the incidence of airway pathology in pediatric patients with burns and identify risk factors for airway injury.

Methods

- This study is a retrospective review of 107 pediatric patients with burns who presented to the Nationwide Children's Hospital emergency department for evaluation of burns between 2015 and 2021.
- Grade of inhalational injury was recorded using the abbreviated injury score (AIS) in **Table 1**. [4]

Grade	Bronchoscopic criteria
Grade 0 (no injury)	Absence of carbonaceous deposits, erythema, edema, bronchorrhea, or obstruction.
Grade 1 (mild injury)	Minor or patchy areas of erythema, carbonaceous deposits in proximal or distal bronchi (any or combination).
Grade 2 (moderate injury)	Moderate degree of erythema, carbonaceous deposits, bronchorrhea, with or without compromise of the bronchi (or any combination).
Grade 3 (severe injury)	Severe inflammation with friability, copious carbonaceous deposits, bronchorrhea, bronchial obstruction (any or combination).
Grade 4 (massive injury)	Evidence of mucosal sloughing, necrosis, endoluminal obliteration (or any combination).

Table 1. Bronchoscopic criteria used to grade inhalational injury. [4]

Results

- Of the 107 patients who presented with burn injuries, 36 (34%) were male.
- Average age of patients was 4.0 years (interquartile range (IQR) 1.6, 11.2).
- 68 patients (64%) presented with HN burns.
- Average total burn surface area (TBSA) of 18% (IQR 13, 35).
- 34 patients (32%) presented with airway symptoms.
- 50 (47%) received supplemented oxygen, 43 (40%) received continuous positive airway pressure (CPAP), 32 patients (32%) had bronchoscopy, 53 (50%) were intubated, and 5 (5%) had a tracheostomy.
- 10% higher TBSA led to 1.53 times the odds of inhalational injury and 2.2 times the odds of intubation, as seen in **Figure 1**, **Figure 2**, and **Table 2**.

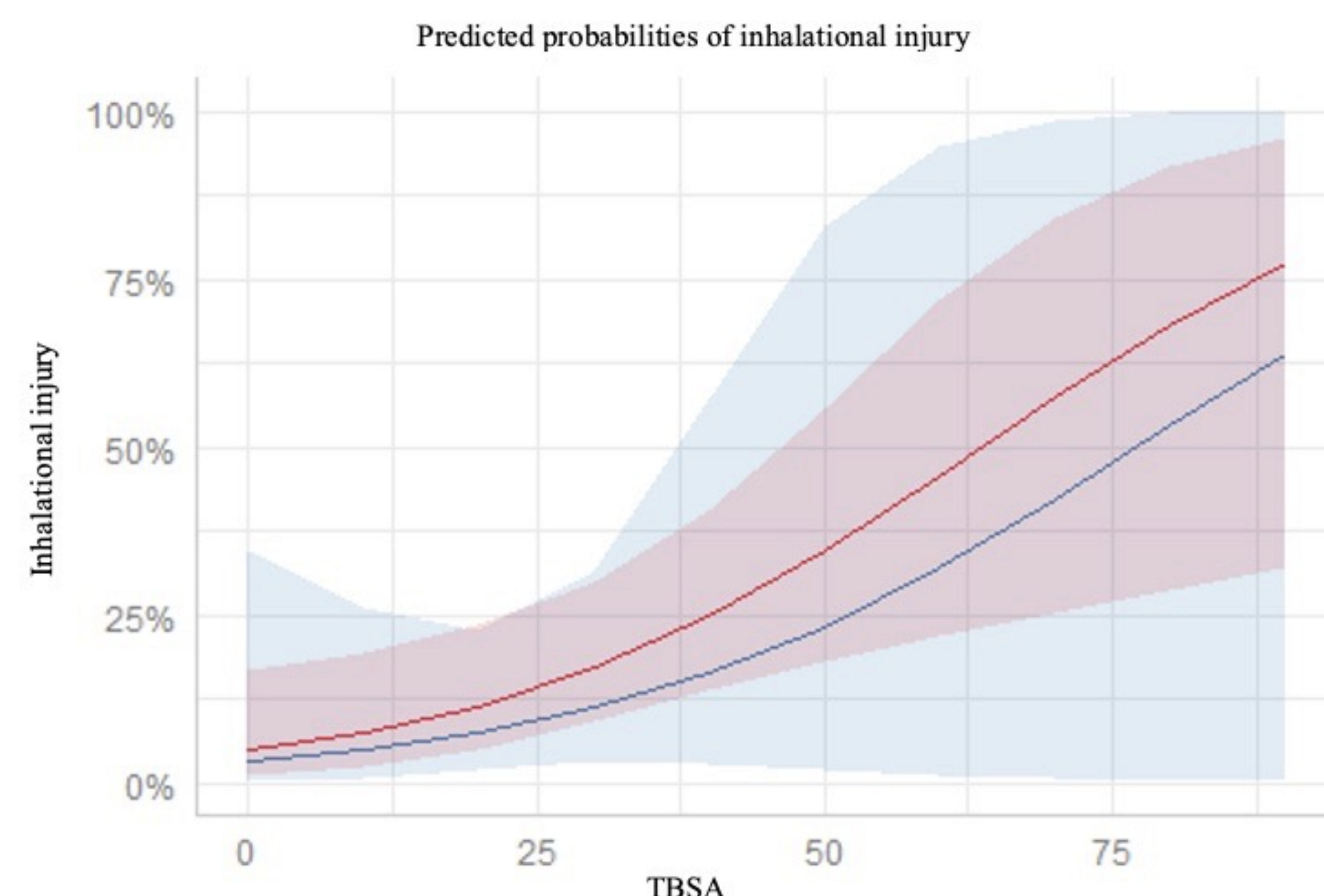


Figure 1. TBSA compared to inhalational injury.

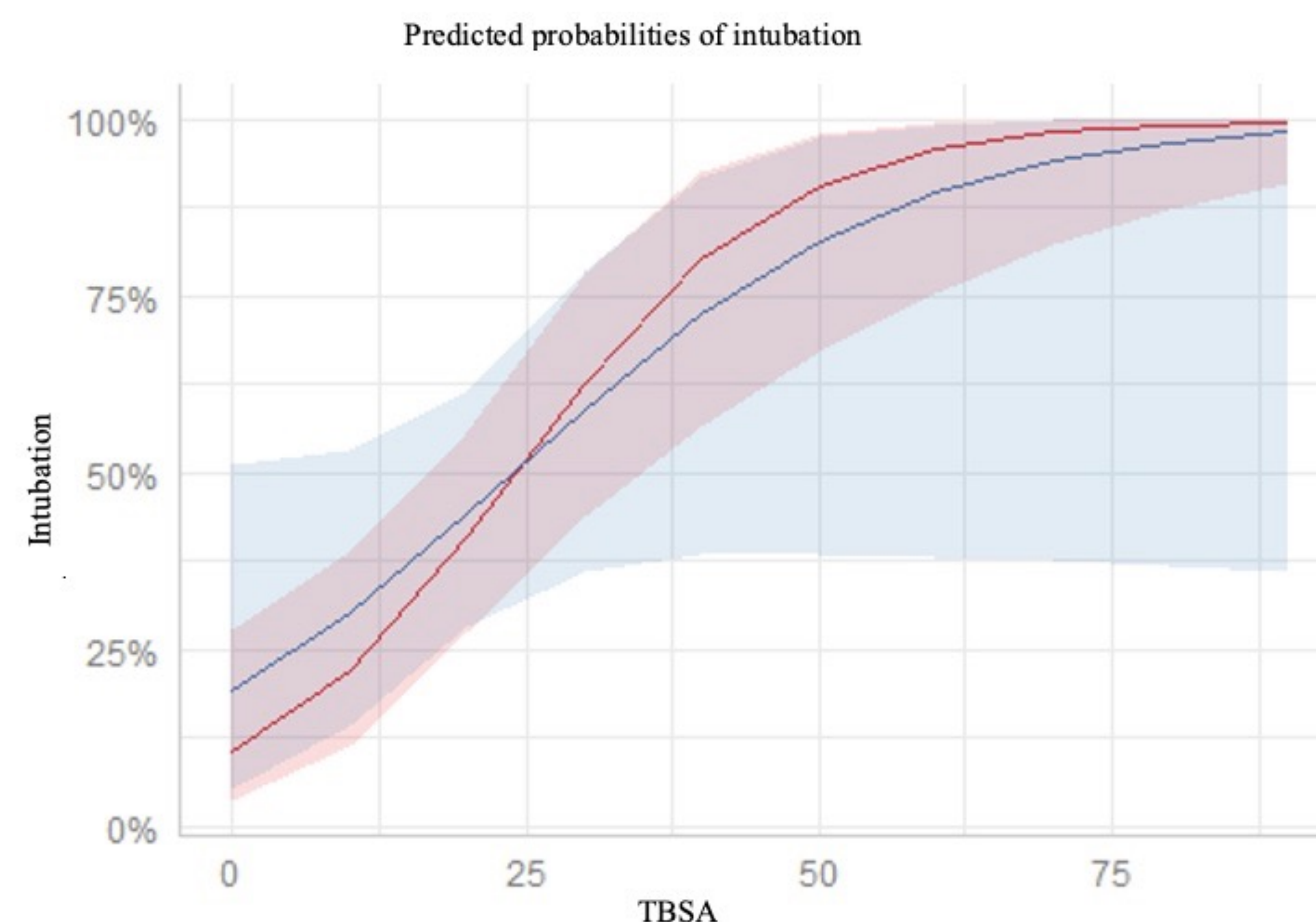


Figure 2. TBSA compared to intubation.

Characteristic	No Branch, N = 76 ¹	0, N = 14 ¹	1, N = 11 ¹	2, N = 4 ¹	3, N = 2 ¹
Supplemental O2?	27 (36%)	9 (64%)	9 (82%)	3 (75%)	2 (100%)
CPAP?	18 (24%)	10 (71%)	9 (82%)	4 (100%)	2 (100%)
Airway symptoms	15 (20%)	8 (57%)	6 (55%)	3 (75%)	2 (100%)
Airway symptoms at time of burn?	6 (7.9%)	3 (21%)	4 (36%)	2 (50%)	2 (100%)
Intubation? (1=Y, 0=N)	26 (34%)	11 (79%)	11 (100%)	4 (100%)	2 (100%)

Table 2. PICU admission distress indicators compared to grade of airway injury.

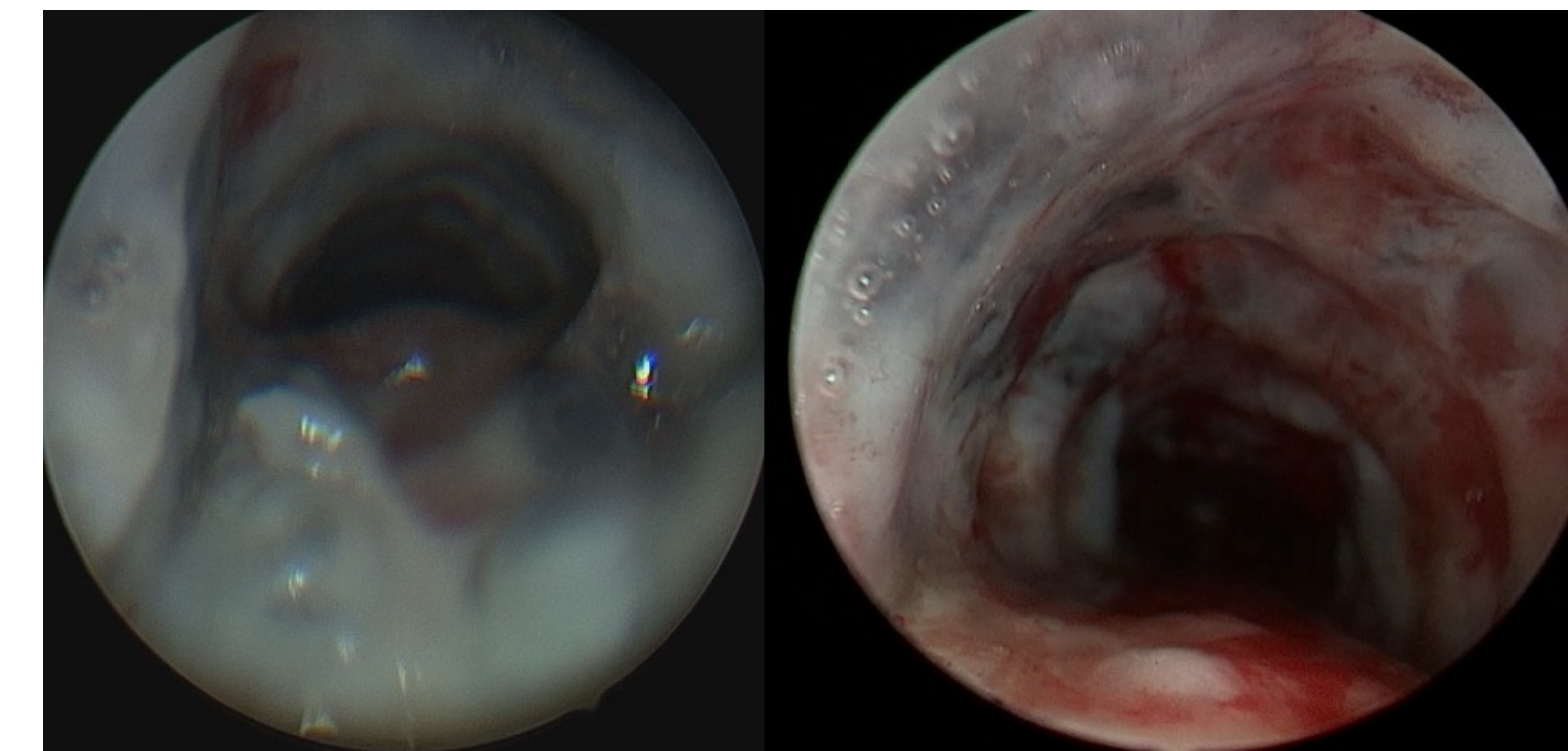


Figure 3. Grade 4 inhalational injury before (left) and after clearance of airway debris and mucosal sloughing (right).

Conclusions

- As total body surface area of patients with burns increases, probability of inhalational injury increases.
- Total body surface and location of burns may predict the likelihood of intubation.
- Consideration of bronchoscopy and intubation based on total burn surface area and presence of head and neck burns may serve as a valuable guide for the treatment plan of pediatric burn patients.

References

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