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Background

- Isolated congenital **micrognathia** affects 1 in 1,500 live births.
- Mandibular distraction osteogenesis (MDO) offers an alternative to tracheostomy to treat severe **obstructive sleep apnea** secondary to micrognathia.
- Despite increasing utilization of MDO, post-operative extubation failure rates range from 16-22%.
- Polysomnography (PSG)** metrics aid tracheostomy decannulation planning but are less commonly considered in extubation planning
- Extubation timing** also remains heavily institution and clinician dependent, recent studies demonstrate safety of immediate extubation

Objective

- To identify the utility of preoperative PSG and extubation timing as **predictors of extubation failure** following mandibular distractor placement

Methods

- IRB-approved retrospective review of pediatric patients undergoing **MDO** from 2006-2022.
- Our institutional MDO algorithm is depicted in Figure 1.
- Demographics, clinical variables, PSG measurements, and distraction variables were collected.
- Patients were categorized as **successfully extubated or reintubated**.
- Primary outcomes included airway events and **reintubation rates**.
- Secondary outcomes included postoperative complications, mortality, LOS, and readmission.
- Receive-operating characteristics (ROC)** analysis, stepwise logistic regression, and Wilcoxon Rank-Sum analysis were performed.

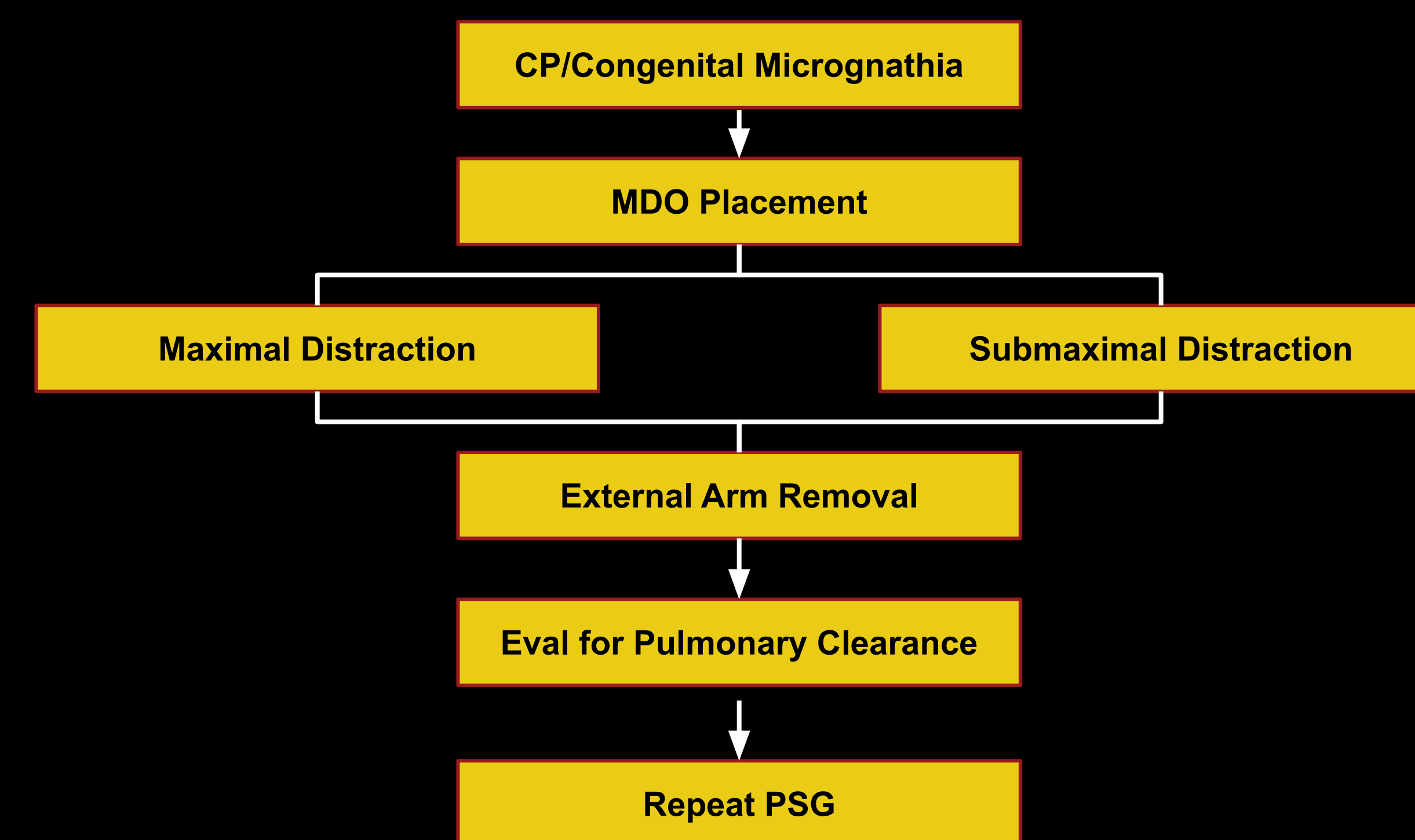


Figure 1: Institutional MDO Algorithm

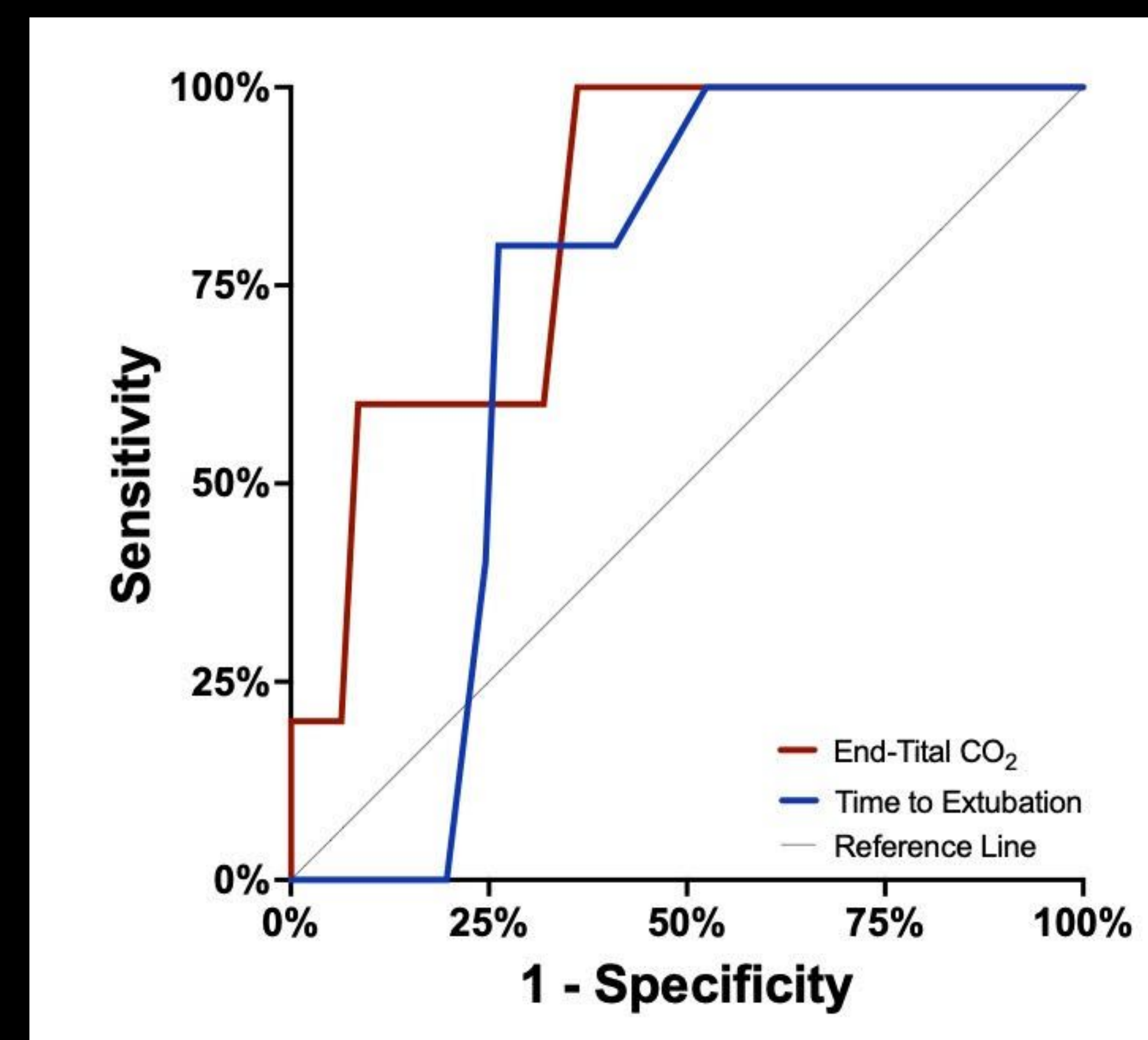


Figure 2: ROC Analysis of Factors Predicting Reintubation Risk

Results

- 107** patients underwent MDO → **99** met inclusion criteria.
- The median time of extubation was 9 days postop.
- 11** patients required **reintubation**, **3** required **tracheostomy**.
- Reintubated patients** had **longer** median **duration of intubation** (12 days vs. 9 days; p=0.006), trended towards having **later extubation** (11 days vs. 9 days; p=0.054), and had longer average **LOS** (75.1±67.1 vs. 37.0±24.1 days; p=0.004) compared to those not reintubated.
- Multivariate regression analysis identified preoperative **end tidal CO₂ (EtCO₂)** (OR: 1.17, 95% CI: 1.02-1.35, p=0.028) as the only significant contributor to **reintubation risk**.
- ROC analysis (Figure 2)
- EtCO₂: AUC = 0.834** [95% CI: 0.68-0.99]
 - Cutoff: EtCO₂ >56.0 mmHg (Sensitivity: 83%, Specificity: 64%). Higher reintubation rate above compared to below cutoff (22.7% vs 0.0%; p=0.023).
- Extubation timing: AUC = 0.721** [95% CI: 0.58-0.96]
 - Cutoff: Extubation time of **9 days** (Sensitivity: 82%, Specificity: 57%).

Conclusions

- 89%** of patients were **successfully extubated** at median of postoperative day 9.
- 97%** of patients **avoided tracheostomy**.
- Patient **EtCO₂ over 56 mmHg** and **extubation after 9 days** were associated with **higher** rates of **reintubation**.
- EtCO₂ was the only predictor of reintubation risk independent of AHI, respiratory comorbidities, intubation duration and extubation timing.
- An **upper bound of postoperative day 9** for **extubation** following distractor placement may improve outcomes.
- Patients with **severely elevated EtCO₂** may benefit from **extubation in a controlled environment like the operating room**.
- Timely extubation may help balance the need for adequate airway opening while avoiding further ventilation perfusion mismatching.