Airway Compromise Following Cleft Palate Repair in Robin Sequence: Improving Safety and Predictability

Background:
Prior studies report a high incidence of airway complications with rates of 23 to 44% in patients with Robin sequence (RS) following palate repair. None of these studies directly measure the severity of airway obstruction preoperatively. Our institution utilizes polysomnography (PSG) to assess risk of airway compromise prior to palatoplasty in these patients. The purpose of this study is to compare airway complications in Robin sequence to cleft palate only (CPO) using this screening airway protocol. In addition, we identify risk factors for airway complications after palatoplasty.

Methods:
A 12-year retrospective review of patients with Robin sequence undergoing palatoplasty was performed. Robin sequence patients were divided into non-operative management (RS-Nonop) or mandibular distraction osteogenesis (RS-MDO) subgroups. Patients with Veau I and II CPO served as matched controls. Preoperative variables, including comorbidities and apnea hypopnea index (AHI), were recorded. The primary outcome was postoperative airway complication, defined as reintubation, emergency room visit, or hospital admission within 3 months of palatoplasty. Significant variables for postoperative airway complications were identified via univariate analysis.

Results:
113 patients met inclusion criteria: 39 (34.5%) CPO, 74 (65.5%) RS, and 34 (30.1%) RS-MDO. The total airway complication rate was 7.1%; this was similar between RS (5.8%) and CPO (7.7%). In isolated Robin sequence, the reintubation rate was 0%. Significant variables for reintubation for all patients were cardiac anomalies (p=0.046), gastrointestinal anomalies (p=0.04), lower airway anomalies (p=0.02) and syndromic diagnosis/genetic anomaly (p=0.052).

Table 1. Patient characteristics

	CPO	**RS, all**	**RS-MDO**	**RS-Nonop**	**Total**	***P* ***
N, (%)	39 (34.5%)	74 (65.5%)	34 (30.1%)	40 (35.4%)	113	
Mean gestational age, wks	37.4	37.7	38	37.8	37.6	0.46
Mean birth weight, kg	3.03	3.04	3.14	2.96	3.03	0.86
Mean age at palatoplasty, mo	13.3	18	16.8	19.2	16.4	**0.006**
Mean AHI prior to palatoplasty	-	3.7	3.9	3.5	-	-
Cardiac, N (%)	2 (5.1%)	13 (17.6%)	3 (8.8%)	10 (25%)	15 (13.3%)	0.08
Central nervous system, N (%)	0	7 (9.5%)	1 (3.2%)	6 (15%)	7 (6.2%)	0.09
Gastrointestinal, N (%)	0	14 (18.9%)	5 (13.3%)	9 (22.5%)	14 (12.4%)	**0.002**
Lower airway, N (%)	1 (2.6%)	10 (13.5%)	7 (20.6%)	3 (7.5%)	11 (9.7%)	0.09
Genetic/syndromic, N (%)	0	16 (21.6%)	6 (17.6%)	10 (25%)	17 (14.3%)	**<0.001**
Isolated disease	34 (87.2%)	44 (59.5%)	21 (61.7%)	23 (57.5%)	78 (83.9%)	**0.003**

CPO, cleft palate only; MDO, mandibular distraction osteogenesis, Nonop, RS managed nonoperatively; AHI, apnea hypopnea index. *RS compared with CPO.

Table 2. Postoperative outcomes

N (%)	CPO	RS, all	RS-MDO	RS-Nonop	Total	*P**
Re-intubation	0	3 (4.1%)	2 (5.9%)	1 (2.5%)	3 (2.7%)	0.55
Hospital admission	0	1 (1.3%)	1 (2.9%)	0	1 (0.9%)	1
ER visit	3 (7.7%)	1 (1.3%)	0	1 (2.4%)	4 (3.5%)	0.12
Airway complications, total	3 (7.7%)	5 (6.8%)	3 (8.8%)	2 (5%)	8 (7.1%)	1
Mean (SD), days						
Length of hospital stay	1.9 (1)	2 (2.5)	2.3 (2.7)	1.8 (2.4)	2 (2.5)	0.76
Time to tongue suture removal	1.2 (0.5)	1.5 (1.4)	1.8 (1.8)	1.1 (0.3)	1.4 (1.2)	0.19
Time to nasopharyngeal tube removal	1.2 (0.4)	1.2 (0.7)	1.4 (0.8)	1.1 (0.2)	1.2 (0.7)	0.46

ER, emergency room. * RS compared with CPO.

Conclusions:

These data suggest that the incidence of airway complications after palatoplasty is not affected by the presence of Robin sequence when using screening PSG. This study, which is the most extensive of its kind, demonstrates that PSG is a critical tool when determining the timing of palatoplasty for patients with Robin sequence. Cardiac, gastrointestinal, lower airway anomalies, and syndromic diagnosis/genetic anomalies are associated with postoperative reintubation. Close postoperative surveillance may be considered in patients with these risk factors.

References:

1. Robin P. Glossoptosis due to atresia and hypotrophy of the mandible. *Am. J Dis.* 1934(48):541-547.
2. Murage KP, Tholpady SS, Friel M, Havlik RJ, Flores RL. Outcomes analysis of mandibular distraction osteogenesis for the treatment of Pierre Robin sequence. *Plastic and reconstructive surgery.* Aug 2013;132(2):419-421
3. Caouette-Laberge L, Bayet B, Larocque Y. The Pierre Robin sequence: review of 125 cases and evolution of treatment modalities. *Plastic and reconstructive surgery.* Apr 1994;93(5):934-942.
4. Henriksson TG, Skoog VT. Identification of children at high anaesthetic risk at the time of primary palatoplasty. *Scandinavian journal of plastic and reconstructive surgery and hand surgery / Nordisk plastikkirurgisk forening [and] Nordisk klubb for handkirurgi.* Jun 2001;35(2):177-182.
5. Lehman JA, Fishman JR, Neiman GS. Treatment of cleft palate associated with Robin sequence: appraisal of risk factors. *The Cleft palate-craniofacial journal : official publication of the American Cleft Palate-Craniofacial Association.* Jan 1995;32(1):25-29.