

Preoperative Feeding Modality Does Not Impact the Occurrence of Bone Healing Complications in Mandibular Distraction Osteogenesis: A Retrospective Case Series

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INTRODUCTION

Mandibular Hypoplasia:

Congenital craniofacial anomaly occurs in isolation or syndromic conditions.

Severity varies; severe cases cause posterior tongue displacement, leading to upper airway obstruction & respiratory difficulties [1-5].

Up to 80% of affected patients experience significant feeding challenges [1,6,7].

Feeding Challenges:

Result from improper intraoral pressure, inadequate sucking mechanics, gastroesophageal reflux, and increased work of breathing [8-10].

Many patients require alternative feeding modalities (NG tubes, G-tubes, TPN) to meet nutritional needs.

Mandibular Distraction Osteogenesis (MDO):

Effective in improving airway patency and serves as a functional, cost-effective alternative to tracheostomy and tongue-lip adhesion [11-15].

Reduces tracheostomy dependence and corrects glossoptosis, improving long-term airway management & quality of life.

Enhances feeding capabilities: 80–100% of neonates with PRS resume oral feeding post-MDO. Up to 83.3% of patients avoid G-tube placement, reducing caregiver burden [16].

Bone Healing Complications & Nutritional Impact:

MDO success depends on proper bone healing, but complications like nonunion and delayed consolidation may occur [12,17,18].

Nutritional status is crucial:

Many MDO patients experience feeding difficulties, potentially impacting bone healing [1,6,7]. Protein deficiencies impair mandibular development & bone volume, particularly in the condylar process [19,20].

OBJECTIVE AND HYPOTHESIS

Investigate whether enteral feeding patients have different rates of bone healing complications than oral feeders.

Hypothesis: Preoperative feeding modality does not have an impact on bone healing complications.

Aim: Identify modifiable factors to enhance MDO success and optimize clinical outcomes.

METHODS

Study Design: Retrospective chart review (2015-2024).

Patient Selection: Single-surgeon cohort of mandibular distraction osteogenesis (MDO) patients.

Initial identification: 26 patients.

Exclusions (n=4): Death prior to distractor removal (n=2) Lost to follow-up (n=1) Ongoing MDO process (n=1)

Final sample size: 22 patients

Data Collected: Patient demographics & medical history: Pierre Robin Sequence, cleft palate, respiratory distress, upper airway obstruction.

Preoperative feeding modality: Oral (PO) vs. non-oral (Non-PO).

Bone healing complications: Delayed consolidation & nonunion. Delayed consolidation: Delay in distractor removal per operative notes, confirmed by X-ray/CT. Final bone consolidation assessment: Categorized as fully consolidated or not during distractor removal surgery.

STATISTICS

Descriptive statistics: Continuous and categorical variables.

Comparative analysis: Fisher’s Exact Test (small sample size).

Predictive analysis: Logistic regression for bone healing complications.

Primary outcome: Bone healing complications vs. feeding modality. Secondary analysis: Patient characteristics predicting bone healing complications.

RESULTS

Table 1: Patient Demographics

	N	%
Total Number of Patients	22	100.00
Sex		
Male	13	59.09
Female	9	40.90
Race		
White	19	86.36
Black or African-American	2	0.09
Asian	0	0.00
American Indian or Alaska Native	0	0.00
Native Hawaiian or Other Pacific Islander	0	0.00
Other	1	5.45
Ethnicity		
Hispanic	2	9.09
Non-Hispanic	20	90.90
Past Medical History		
Preoperative OSA	5	22.73
Upper Airway Obstruction	22	100.00
Respiratory Distress	20	90.90
History Of Tracheostomy	3	13.63
Feeding Difficulties	21	95.45
Cleft Palate	17	77.27
Pierre Robin Sequence	16	72.73
Preoperative Feeding		
PO	6	27.27
Non-PO	16	72.73
NG	10	45.45
OG	1	4.54
NG/OG	1	4.54
G	4	18.18
Preoperative Weight (kg)	Mean: 6.996 SD: 8.819 Range: 2.915-35.335	

Table 2: Operative and Distraction Data

	Mean	St Dev	Range
Age at Surgery (months)	14.77	40.929	0.30 months – 15 years
Latency Period (days)	1.64	1.177	1-5
Distraction Period (days)	15.09	3.463	7-22
Starting Distraction Rate per day (mm)	1.364	0.2787	0.9-1.8
Total Distance Distracted Right Side (N=22)	17.895	1.3868	15.5-20.0
Total Distance Distracted Left Side (N=21)	18.067	1.7174	14.0-20.0
Consolidation (days)	158.23	61.365	55-299

Table 3: Bone Healing Complications: Fisher’s Exact Test used to examine bone healing complications against Non-PO Feeding Modality

Outcome	Total (Patients)	PO Feeding (%)	Non-PO Feeding (%)	P-Value*
Bone Healing Complication	10	3 (50.00%)	7 (43.75%)	1.000
Delayed Consolidation	7	2 (33.33%)	5 (31.25%)	1.000
Nonunion	6	2(50.00%)	4 (25.00%)	1.000

*Fisher’s Exact Test was used due to small sample size and low expected cell counts (<5 in more than 50% of cells).

Table 4: Logistic Regression Analysis of Predictors of Bone Healing Outcomes

Outcome	Predictor	OR (95% CI)	P-Value
Bone Healing Complication	Age at Surgery	1.055 (0.959-1.161)	0.272
	Preoperative Weight	0.769 (0.488-1.212)	0.257
	Non-PO Feeding	2.016 (0.154-26.309)	0.593
	PRS	1.172 (0.095-14.434)	0.901
	Cleft Palate	0.169 (0.006-4.632)	0.292
Delayed Consolidation	Age at Surgery	1.066 (0.963-1.180)	0.221
	Preoperative Weight	0.721 (0.435-1.193)	0.203
	Non-PO Feeding	7.155 (0.086-597.411)	0.383
	PRS	0.694 (0.043-11.131)	0.796
	Cleft Palate	0.029 (0.000-4.845)	0.175
Nonunion	Age at Surgery	0.025 (0.000-3.015)	0.132
	Preoperative Weight	0.071 (0.000 -15.122)	0.333
	Non-PO Feeding	0.045 (0.000-11.251)	0.271
	PRS	0.004 (0.000-12.069)	0.177
	Cleft Palate	0.000 (0.000-32.363)	0.086

PRS= Pierre Robin Sequence

DISCUSSION

MDO & Bone Healing:

MDO improves airway function and feeding but can lead to nonunion and delayed consolidation [17,12,18].

Limited research explores the impact of preoperative feeding modality on bone healing.

Key Findings: No significant association between feeding modality and bone healing complications (Table 3).

Possible explanations: Nutritional needs were met, or Other factors (age, weight, cleft palate, PRS) play a larger role.

Predictors of Bone Healing Complications:

Logistic regression: No significant predictors found.

Non-PO feeding showed the strongest (but non-significant) association: Bone healing complication: OR = 2.016 (p = 0.593). Delayed consolidation: OR = 7.155.

Small sample size limits statistical power.

CLINICAL IMPLICATIONS

Limitations:

Small sample size limits generalizability. Retrospective design introduces potential bias.

Conclusion: As patients undergo preoperative optimization, including weight stabilization and managing comorbid conditions, emphasis should not be placed on non-oral feeding, and delaying MDO until achievement of exclusive oral feeding should not be practiced.

When evaluating these patients and discussing potential risks and complications of operative invention with patients’ families, PO feeding should not be used as a predictive

The knowledge that the patient’s method of feeding will not impact the surgical outcomes of a complicated surgery like MDO could significantly reduce parental anxieties.

FUTURE

Larger, Multicenter Studies needed to Improve statistical power and generalizability.

Standardize Nutritional Evaluation: Define preoperative nutritional thresholds (e.g., BMI-for-age, weight gain trends)

Surgical & Healing Factors: Investigate distraction protocols variations and role of adjunct therapies (e.g., BMPs, PRP) in high-risk patients.

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