

# Facemask midfacial protraction — an overview

Dr. Duane Grummons discusses the benefits of Facemask therapy

Nasomaxillary respiratory orthopedic applications of the Grummons Facemask with individualized protraction and slow palatal expansion show validated sutural responses and favorable airway flow benefits. Resolution is achieved with transverse and protraction movements of maxillae with circummaxillary sutural growth modification.<sup>1</sup> Favorable effects follow:

- more convexity of facial profile with forward relocation of maxillae
- proclination of maxillary incisors
- counterclockwise rotation of palatal plane<sup>2</sup>
- neutral posturing of mandible
- clockwise rotation of mandibular plane
- more upright lower incisors
- improved airway width and flow characteristics

Skeletal Class III patients have maxillary deficiency in 85% of cases; mandibular excess in 5% to 8%; combination in 7% to 10%.<sup>3</sup> Airway and breathing disordered sleep (SDB) are priorities. Maxillae articulate through the following:

- midpalatal (MPS)
- frontomaxillary (FMS)
- zygomaticomaxillary sutures (ZMS)
- transverse palatine (TPS)
- nasomaxillary
- lacrimal
- ethmoid.

Zygoma (malar) and external orbital regions are divinely designed to mature early to protect orbital vital structures. ZM sutural configurations are obliquely oriented, tortuous, and intermingled to withstand trauma and sustained compressive loading of the facemask. Maxillary complex research

used lateral implants from 4 to 21 years.<sup>4</sup> Superimpositions of zygomatic processes proved no striking remodeling of the anterior surface in the anteroposterior direction.<sup>5</sup> Malar stability permits facemask pads to rest here.

ZM sutures are resistive to remodeling.<sup>6</sup> Complexity of interdigitations is greater in ZMS than other circummaxillary sutures. ZMS are longest and thickest of maxillary sutures, which limits change under protraction forces. When mid-palatal and nearby sutures are orthopedically activated, the ZM suture does not respond in the same ways. Serial x-rays of children's zygomatic/malar relationships and point A were reported.<sup>7</sup> After these studies, the Grummons Facemask with frontal/zygoma support was innovated.

### Earlier intervention

Facial growth is 60% completed by ages 5 to 6 and 80% by age eight. Earlier treatment involves a nasomaxillary orthopedic expander, facemask protraction therapy, a mandibular dentoalveolar expander, and occlusal composites on primary molars bilaterally. As primary posterior teeth expand, the alveolar processes remodel wider with increased arch perimeter for unerupted teeth and area for tongue volume away from pharyngeal region. Myofunctional therapy (MFT) corrects low tongue posture, abnormal swallow, and helps achieve nasal breathing.

Facial orthopedics or surgery overcome Class III underbite and midfacial mismatches.

Transverse sutural and alveolar remodeling occur with forward displacement of the maxillary complex from the pterygoid region. Facemask therapy in primary dentition is 70% orthopedics and 30% dentoalveolar; mixed dentition is 30% orthopedics, 70% dentoalveolar; and permanent dentition is dentoalveolar.

Facemask shaping is individualized:

1. Facemask bendable to facial contours.
2. Bend malar supports by knuckle of finger to create malar contour.
3. Frontal support above eyebrows.
4. Bend frame longer, shorter, wider, or narrower to match face.
5. Place pads on frontal and malar regions; extra pads for comfort.
6. Place passively. If crib is on lips, add one to three pads on malar supports so crib clears lips.
7. Velcro headstrap to frame with light fit to occipital region.



Figure 1: Young midfacial deficiency



Figure 2: Grummons Facemask (greatlakesdentaltechnologies.com)



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Figure 3: Class III resolution in deciduous dentition phase

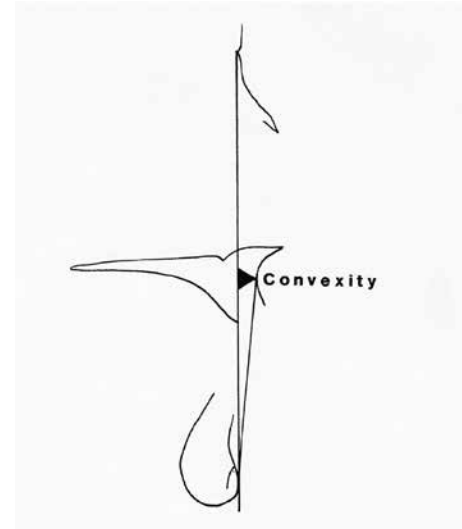


Figure 4: Point A +3-4mm forward

8. Place facemask from behind into place in one motion.
9. Readjust headstrap so mask is oriented to face and comfortable.
10. Elastics from molar band hooks or from buccal arms to crib. Traction is forward and downward.
11. Protocol: bilateral 3/8 or 5/16 inch, 8 oz. elastics for first 1 to 2 weeks; transition to 1/4 or 1/2 inch, 6.5 oz. heavy, or 5/16 or 1/2 in 14 oz. elastics.
12. Begin 1 to 2 hours wear while awake; soon while sleeping 8 to 10 hours.
13. Optimum: 8 to 10 hours traction for maxillary orthopedics forward.

**Week 1:** Facemask, 1 hour awake; one elastic per side

**Week 2:** Two hours awake; two elastics per side

**Week 3:** One hour before bedtime and while sleeping, two elastics per side

Midfacial orthopedics with transverse maxillae expansion can be skeletal (sutural), dentoalveolar, and/or dental arch. Thin-plate spline analysis of rapid maxillary expansion with facemask therapy in early Class III malocclusions shows forward displacement of the maxillary complex from pterygoid region with clockwise rotation of mandible.<sup>8</sup> Nasomaxillary respiratory regions are better developed with protraction facemask therapy and orthopedic SLOW expansion of 2 to 3 turns per week.

Point A is most anterior point in convexity of maxillae in median sagittal plane. Well-balanced adult faces have point A ahead of nasion perpendicular by 4 mm in females and 1.1 mm in males, reported by McNamara.<sup>9</sup> Maino G, et al.,<sup>10</sup> Ricketts and Grummons<sup>11</sup> recommended forward placement of point A with convexity of +3-4mm (face forward).



Figure 5: Occlusal rests secure appliance for less tipping of teeth; buccal arms for elastics



Figure 6: 3-way expander yields arch length at molars while facemask relocates maxillae forward



Figure 7: Slow FAN palatal expansion (PE), or EDO appliance (greatlakesdentaltech.com) with two screws, or MSE (Moon) with facemask develop nasomaxillary respiratory regions

### Facemask and slow PE/ME

Facemask protraction of the nasomaxillary complex with point A relocation forward is a key clinical objective. The maxillary

expander has bilateral buccal arms soldered to molar bands, extending forward to the region of maxillary canines. Slow activations best influence the circummaxillary sutures

and nasomaxillary respiratory regions.

Typically, maxillary skeletal deficiency patients demonstrate mandibular overclosure with lower facial vertical deficiency. Occlusal molar composites lift the bite.

The 3-Way maxillae expander<sup>12</sup> with molar springs provides derotation as maxillae-palatine structures are protracted with the Grummons orthopedic Facemask. Movements are three-dimensional (tip, yaw, roll): molar extrusion/intrusion, occlusal plane leveling, and midline correction.

BAMP (bone-anchored maxillary protraction) RPE or MSE (Moon) palatal expander (MARPE) with facemask yields greater maxillary advancement compared to facemask with tooth-borne maxillary expansion.

Maxillary midline (yaw) correction is achieved with buccal arms shorter on one side, so the dental arch moves forward and midline improves by shifting to opposite side. Buccal arms are adjusted parallel to the occlusal plane (OP) for straight pull forward. One buccal arm can be bent higher at the canine region, so the dental arch moves inferiorly as occlusal plane levels (roll). Mandibular protraction of both arches corrects bidental retrusion. The upper arch can move forward in Class III malocclusion. Elastics from lower molars to facemask crib relocate the lower arch forward to help correct Class II malocclusion to the extent periodontal support permits,

Research on the Grummons Face-mask<sup>13</sup> showed decisive improvements in the sagittal-basal relations as upper molars moved forward 4.1 mm from pterygoid vertical with point A moved 2.2 mm forward. Grummons Facemask relocated maxillary point A forward by 3.4 mm for the composite sample.<sup>14</sup> The effectiveness of alternating expansion and constriction enhances maxillary protraction.

Surgically facilitated orthodontic treatment (SFOT) (premolars previously removed by colleague's treatment) included a palatal expansion appliance with bilateral corticotomies (maxillae surgically mobilized), and TADS with facemask protraction.

Sustained TMJ compression is unfavorable to the TMJ components that are designed for intermittent loading during functional movements. A facemask with chin-cup delivers unfavorable compressive loading upon TMJ posterior attachment, collateral ligaments, and condyle-disc assembly. The chin-cup facemask caused 24% of TMJ internal derangements from forces that are non-physiologic and detrimental.<sup>15,16</sup> Three types of protraction facemask headgear



Figure 8: Slow PE with facemask; point A relocates forward and inferiorly



Figure 9: Airway (before/after) optimized by dual upper/lower expanders with protraction Grummons Facemask therapy

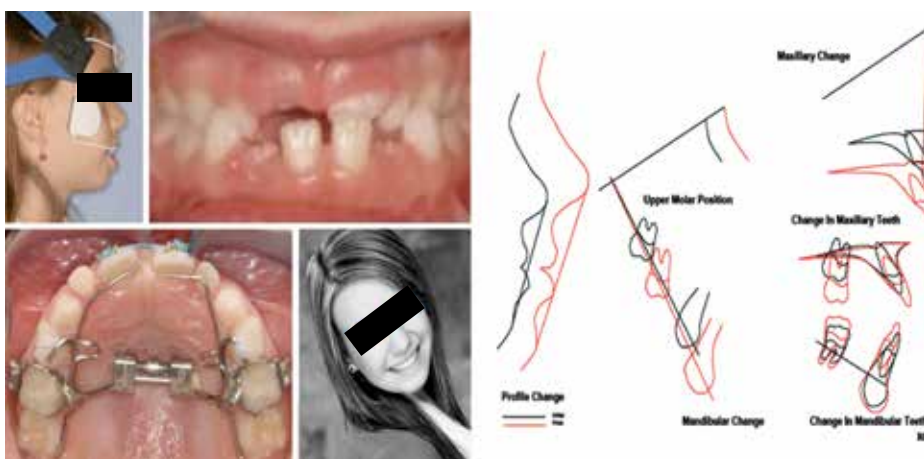


Figure 10: Nasomaxillary respiratory complex moved forward and inferiorly. (superimpositions: [www.bioprogressive.org/RMODS](http://www.bioprogressive.org/RMODS))

were researched<sup>17</sup>; the Grummons Facemask had no unfavorable TMJ effects.

### Maxillary arch is template for lower

Facemask with elastics to the upper molars neutralizes the distal thrust of a Herbst or Class II corrector, so point A remains well-placed in the face. The perimeter and shape of maxillary arch influences lower arch dimensions (like a lid on a box). The lower arch has clinical limitations for arch expansion. The maxillary arch width is the template for mandibular arch width and lower arch emplacement. As the upper transverse is improved, the lower widens with decompensated and uprighted Curve of Wilson. As the lower teeth move/angulate forward, this adds to upper arch movement forward with facemask.

Upper airway dimensional changes improve laminar airflow following maxillary

protraction upon craniofacial structures.<sup>18</sup> Improvement was seen in sleep scores and symptoms after bimaxillary expansion with facemask protraction of arches forward.<sup>19</sup>

### Summary

Treat earlier with Class III nasomaxillary respiratory corrective orthopedics with face-forward facemask changes. It is better to shape the child's developing facial structures for best physiologic airway than to repair or manage them as adults. Let's copy nature in her fundamental majesty. **OP**

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Figure 11: Facemask with SARPE assisted maxillae protraction

Figure 12: Facemask chin cup affects the TMJs



Figure 13: Mixed dentition Grummons Facemask; distraction osteogenesis forward and inferiorly

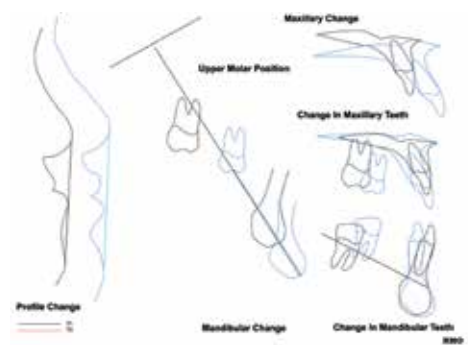


Figure 14: Superimpositions (www.bioprogressive.org/RMDS)



Figure 15: Wider, uprighted arch perimeter with forward arch placement (2 case examples)



Figure 16: Lifetime benefits: midfacial facemask orthopedics forward