Case Report

Usage of Titanium Molybdenum Alloy Wires in Nasal Molding: A Case Report

Rahime Burcu Nur, DDS, PhD;[1,*] Begüm Yildiz, DDS;[2] and Derya Germeç Çakan, DDS, PhD[3]

ABSTRACT
The purpose of this case report is to present the nasoalveolar molding treatment (NAM) of an infant with complete unilateral cleft lip using a nasal stent with conventional configuration made of 0.32-inch titanium molybdenum alloy (TMA). An additional nasal stent with the same configuration was constructed of stainless steel wire, and the force application by the same activation was measured. In patients with cleft lip who benefit from NAM therapy but cannot come regularly to the weekly appointments, nasal stents made of TMA may be recommended due to lighter and continuous force application.

KEY WORDS: Nasal molding, Titanium molybdenum alloy

INTRODUCTION

The main objective in nasoalveolar molding (NAM) therapy in infants with cleft lip and palate (CLP) is to reshape the lip and alveolus as well as the nasal components so that it resembles the normal anatomy before surgical intervention.[1–4] Hence, nasal cartilage in infants shows plasticity several weeks after birth, and the nasal molding can be performed successfully. Columella lengthening, correction of the nasal cartilage deformity, and stretching of nasal mucosa can be achieved by adding the nasal stent or stents to the vestibular flange of the NAM appliance in unilateral and bilateral CLP cases, respectively. In infants with unilateral CLP, this nasal stent is gradually activated through weekly appointments over a period of approximately 2–3 months.

Initially the nasal stent was made of acrylic[3]; however, nowadays the conventional trend described by Grayson and Maull[5] is to fabricate it from 0.36-inch round stainless steel (SS) wire. Recently, researchers introduced the use of titanium molybdenum alloy (TMA) in NAM therapy.[6,7] Titanium molybdenum wire is ductile and can be formed into different shapes, and using it in nasal stent fabrication may decrease the duration and the frequency of visits.[6]

NAM therapy is always performed in cleft centers or university hospitals. Therefore, to get this health service, some families have to travel long distances, which means consumption of time and additional cost. In our university, more than half of the families of infants with CLP are referred from rural areas, peripherally to the city. One of the main complaints about the therapy stated by the caregivers is the frequency of visits for modifications.

Therefore, in this case report, the purpose is to present the visit and activation frequency of NAM therapy of an infant with complete unilateral cleft lip using a nasal stent of TMA and compare the force delivery with SS of the same configuration.

CASE REPORT

A 10-day-old girl with left complete cleft lip was referred to the cleft clinic of our university. Her clinical observation revealed separated lip segments, depressed lower lateral alar cartilage, de-

[1]Teaching Assistant, Yeditepe University, Faculty of Dentistry, Department of Orthodontics, Istanbul, Turkey
[2]Postgraduate student, Yeditepe University, Faculty of Dentistry, Department of Orthodontics, Istanbul, Turkey
[3]Associate Professor, Yeditepe University, Faculty of Dentistry, Department of Orthodontics, Istanbul, Turkey

***Corresponding author:** Dr. R. Burcu Nur, Bagdat Cad. No: 238, 34728 Göztepe, Istanbul, Turkey. Tel: +90-216-363 6044 Fax: +90-216-363 6211
E-mail: drburcunur@gmail.com

To cite this article: Nur B, Yildiz B, Germeç Çakan D. Usage of titanium molybdenum alloy wires in nasal molding: a case report. *Turkish J Orthod*. 2015;28:26–30 (DOI: http://dx.doi.org/10.13076/TJO-D-15-00001)
Date Submitted: January 2015. Date Accepted: February 2015.

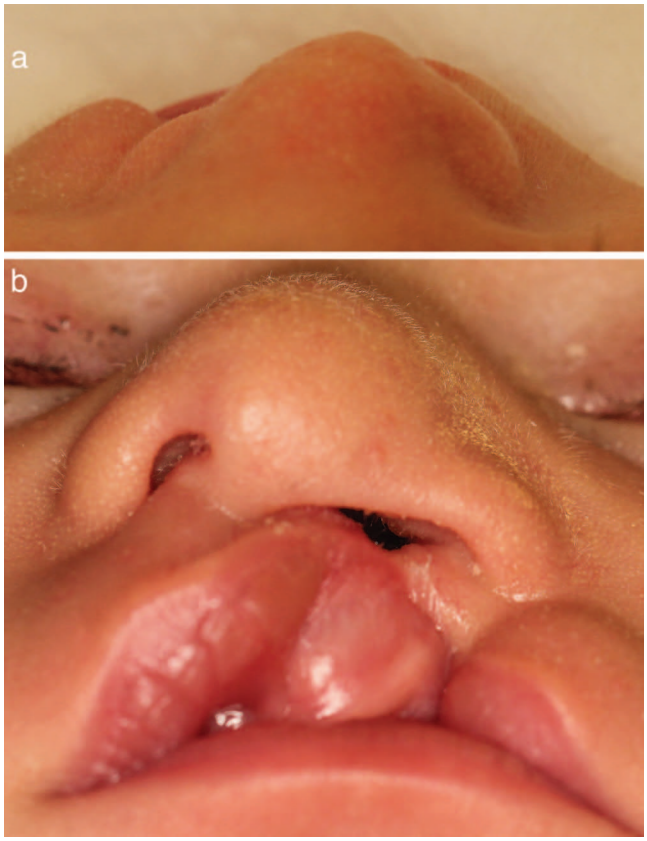

Figure 1. Extraoral photographs at onset of nasoalveolar molding therapy. (a) Nostril view. (b) Columellar view.

pressed and displaced nasal tip, and deviation of columella toward the noncleft side (Fig. 1a,b). A microform cleft on the alveolus was present, whereas the preincisive trigone and hard palate were not affected. Extraoral and intraoral impressions were obtained in the hospital setting, and a conventional molding plate was fabricated using acrylic resin to mold the nasal cartilage.

A retention button was added to the plate, which was located closer to the smaller lip segment. A nasal stent of 0.32-inch TMA was made, starting with the setting of retention arm of the stent into the plate using self-cure acrylic. After the measurement of the distance from the molding plate into the nasal dome using orthodontic wax, the nasal stent was bended with orthodontic plier resembling a swan neck identical to the protocol defined by Grayson and Maull[5] (Fig. 2a).

The stent was inserted inside the nose underneath the alar apex. The configuration as well as the activation was controlled by inspecting the mild temporary blanching of the soft tissues on the alar dome. Modifications were performed until the required activation had been achieved. Afterwards, the circumference of the neck of the stent was covered with a hard acrylic layer to increase endurance and then with a thin soft acrylic layer to prevent injury and irritation (Fig. 2a).

The height of the nasal stent was measured as 15 mm extraorally (Fig. 2b). When the appliance was placed, the same distance decreased to 13 mm (Fig. 2c). To evaluate the force delivery to the tissue, the stent was deflected 2 mm extraorally. The cursor of the intraoral force gauge demonstrated 100*g* of delivery force for the aforementioned deflection (Fig. 2d). An additional nasal stent with the same configuration and dimension was constructed of stainless steel wire only to compare the force delivery of the different materials. The force application of SS nasal stent by the same deflection was 180*g* (Fig. 2e).

The alar dome cartilage was lifted upward and outward until normal symmetry was achieved. The infant was followed and reactivation of the stent was performed monthly. In order to bring the lip closer, a horizontal band starting from the noncleft side towards the cleft side was applied and introduced to the caregivers. Parents were informed to keep the molding plate in place at all times except during the cleaning period after feeding. The total number of visits was 6 within a period of 3 months in which the nostril was molded and the nasal tip projection was achieved (Fig. 3a,b).

DISCUSSION

The treatment of individuals with cleft is a long process performed by a multidisciplinary team starting from birth. The primary lip and palate surgeries are carried out in the infancy period, even though Sischo *et al*.[8] identified the number of subsequent interventions ranging from 2 to 20 before adulthood. The treatment process is costly as well as time consuming. Therefore, the requirements of the family members should be incorporated in treatment planning.

The NAM therapy significantly contributes to the symmetry of the nose in infants with cleft lip before surgical intervention.[9] The reduction in the severity of the hard and also soft tissue deformity enables the surgeon to perform the operation under minimal tissue tension. Moreover, Maull *et al*.,[10] mentioned that the symmetry of the nose obtained by NAM therapy is long-standing. Punga and Sharma[11] compared the outcomes of presurgical molding plates with and without nasal stents and concluded

Figure 2. (a) Nasoalveolar molding treatment plate with nasal stent of titanium molybdenum alloy (TMA). (b) Measurement of nasal stent height extraorally (15 mm). (c) Measurement of activated nasal stent height intraorally (13 mm). Force delivery on 2-mm deflection of (d) TMA nasal stent (100*g*) and (e) stainless steel nasal stent (180*g*).

the significant improvement of nasal morphology. Indeed, the correction of the nasal asymmetry was produced by the active force delivered from the nasal stent of NAM under oral functions. However, they concluded in concordance with the objective of the present study, that the compliance of patients' parents about the timely recall visits plays a major role in the success of NAM therapy. Moreover, Bajaj *et al*.,[12] mentioned that the acceptance of NAM in India is not widespread because of the inability of caregivers to follow the frequent adjustment visits.

Modifications of the nasal stent made of SS are required in weekly intervals. Activation is performed by gradually adding soft tissue layers on the button of the swan neck of the stent and/or bending the wire. The estimated follow-up visits in an infant with unilateral cleft is approximately 13 to 14 times.[8]

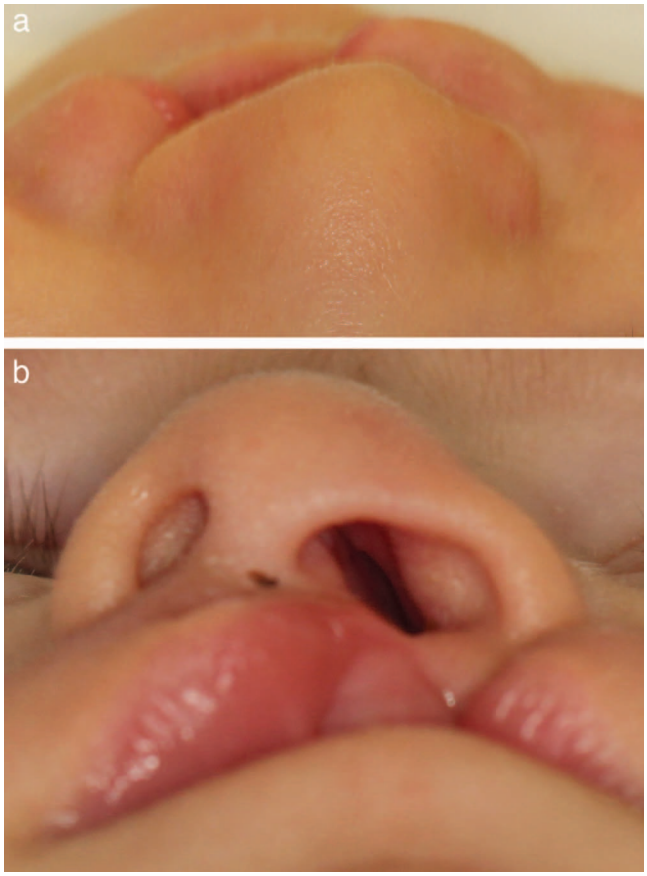

Figure 3. Extraoral photographs after nasoalveolar molding therapy. (a) Nostril view. (b) Columellar view.

The force delivery of nasal stents made of SS and TMA was measured as 180*g* and 100*g*, respectively. Stainless steel is a stiff material, which is prone to permanent deformation after bending. On the other hand, TMA is highly ductile and can be converted into different shapes. Additionally, it can be deflected twice as much as SS without permanent deformation, and therefore the force delivery is almost half of SS. Krishnan and Kumar[13] especially emphasized the lower and more constant force of this material compared to stainless steel. The mentioned properties of this material may be an alternative for nasal stents in NAM therapy. Nagraj *et al*.[6] using TMA for nasal stent fabrication in their research stated a decrease in the number of visits to 8–10. The main objective in their research was to evaluate a double-loop technique using the ductility of the wire to simplify and lessen the duration time for activation. In our case, instead of facilitation of the activation period using loops, the main goal was to manage the continuous appropriate force delivery to decrease the follow-up visits with the conventional configuration of the nasal stents. As a result of using the TMA nasal stent, the number of follow-up visits was reduced.

CONCLUSION

Families, especially those living in rural areas and travelling long distances to benefit from the NAM therapy, are concerned about the number of appointment visits. They have to take a day off from work weekly, which may be problematic in the long term. Furthermore, low economic status of these families may cause distress due to travel cost.

Nasal stent made of TMA delivers lighter and continuous force compared to SS. Moreover, the activation intervals of NAM were longer, resulting in fewer visits. Therefore, in cases with cleft lip only, in which alveolar molding is not required, nasal stent made of TMA instead of SS may be recommended.

REFERENCES

1. Grayson BH, Cutting CB, Wood R. Preoperative columella lengthening in bilateral cleft lip and palate. *Plast Reconstr Surg*. 1993;92:1422–1423.
2. Cutting CB, Grayson BH, Brecht L, Santiago P, Wood R, Kwon S. Presurgical columellar elongation and primary retrograde nasal reconstruction in one-stage bilateral cleft lip and nose repair. *Plast Reconstr Surg*. 1998;101:630–639.
3. Grayson BH, Santiago PE, Brecht L, Cutting CB. Presurgical naso-alveolar molding in patients with cleft lip and palate. *Cleft Palate Craniofac J*. 1999;36:486–498.
4. Germeç Çakan D, Diren S, Nur RB. Use of elastic tapes in presurgical nasoalveolar molding: a case report. *Turkish J Orthod*. 2014;27:34–38.
5. Grayson BH, Maull D. Nasoalveolar molding for infants born with clefts of the lip, alveolus, and palate. *Clin Plast Surg*. 2004;31:149–158.
6. Nagraj N, Nagarjuna M, Desai AK, Gandedkar N, Jayade B, Gopalkrishnan K. Double-loop technique using titanium molybdenum alloy wire for fabrication of nasoalveolar molding therapy for cleft lip and palate patients. *Cleft Palate Craniofac J*. 2015;52:246–249.
7. Taniguchi M, Oyama T, Kiya K, Sone Y, Ishii N, Hosokawa K. A novel pre-surgical maxillary orthodontic device using b-titanium wire for wide unilateral cleft lip and palate patients: preliminary study of its efficacy and impact for the maxillary formation. *Plast Reconstr Surg*. 2014;67:167–172.
8. Sischo L, Chan JW, Stein M. Nasoalveolar molding: prevalence offering NAM and who seek it. *Cleft Palate Craniofac J*. 2012:49:272–275.
9. Grayson BH, Cutting CB. Presurgical nasoalveolar orthopedic molding in primary correction of the nose, lip, and alveolus of infants born with unilateral and bilateral clefts. *Cleft Palate Craniofac J*. 2001;38:193–198.
10. Maull DJ, Grayson BH, Cutting CB, Brecht LL, Bookstein FL, et al. Long-term effect of nasoalveolar molding on three-

dimensional nasal shape in unilateral cleft. *Cleft Palate Craniofac J*. 1999;36:391–397.

11. Punga R, Sharma SM. Presurgical orthopaedic nasoalveolar molding in cleft lip and palate infants: a comparative evaluation of cases done with and without nasal stents. *J Maxillofac Oral Surg*. 2013;12:273–288.
12. Bajaj A, Rao KS, Sharma SM. Modified presurgical nasoalveolar molding in the infants with complete unilateral cleft lip and palate: a stepwise approach. *J Maxillofac Oral Surg*. 2011;10:275–280.
13. Krishnan V, Kumar KJ. Mechanical properties and surface characteristics of three arch wire alloys. *Angle Orthod*. 2004; 74:825–831.