

Precision Distractor Placement with a Custom-Made Index

JOHN W. KING, DDS, MS
JAMES C. WALLACE, DDS
DAVID SCANLAN, CDT

Many authors have emphasized the importance of the “vector of distraction” in mandibular widening by distraction osteogenesis.¹⁻⁵ Achieving the ideal direction of distraction depends on both proper presurgical treatment planning and the oral surgeon’s ability to place the distractor precisely.

Although most research has focused on the sagittal vector of distraction, the transverse plane is equally important. For best results, the distractor’s expansion screw should be parallel to the transverse mandibular occlusal plane.⁶⁻¹⁰ To help accomplish this goal, we have developed a light-body polyvinyl siloxane index that can be integrated with the custom-made Distrax* appliance¹¹ (Fig. 1).

The initial development of this index was

prompted by the occurrence of an unexpected posterior open bite, accompanied by clicking of the TMJ, in a 31-year-old female (Fig. 2). We later discovered that the distractor had been placed at a 5.5° cant to the mandibular occlusal plane (Fig. 3). Fortunately, the open bite was quickly closed with vertical elastics, and the clicking subsided.

Procedure

After the Distrax is constructed, the appliance is attached to the model with sticky wax, and undercuts for all the anterior brackets and the archwire are blocked out with wax. It is important to verify that the expansion screw** is parallel to the occlusal plane (Fig. 4). Dimension Garant L polyvinyl siloxane*** is then injected over the anterior teeth and the upper arms of the distractor (Fig. 5). Unless the patient has a shallow vestibule, the appliance can usually be tried in the mouth prior to surgery.

Autoclaving the index and distractor before surgery may cause minor distortion of the polyvinyl siloxane, but this has not proven sig-



Fig. 1 Distrax appliance.

*Accutech Orthodontic Lab, Inc., 420 Southlake Blvd., Richmond, VA 23236.

**SUPERScrew-SUPERSpring Co., 135 Stables Way, Highwoods, IL 60040.

***3M ESPE Dental Products, P.O. Box 33275, St. Paul, MN 55133.

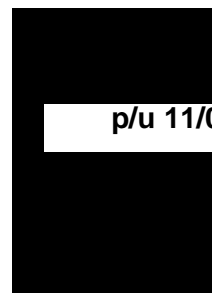


Fig. 2 A. 31-year-old female patient before mandibular distraction. B. Posterior open bite after 10mm of distraction. C. After use of vertical elastics.

Dr. King is in the private practice of orthodontics at 5921 Harbour Lane, Suite 300, Midlothian, VA 23112; e-mail: DrJKingortho@aol.com. Dr. Wallace is in the private practice of oral and maxillofacial surgery in Richmond and Midlothian, VA. Mr. Scanlan is a certified dental technician and part-owner of Accutech Orthodontic Lab, Richmond, VA. Dr. King is the inventor of the Distrax and has a financial interest in the appliance.



Dr. King



Dr. Wallace



Mr. Scanlan

p/u 11/01, p.667

nificant enough to affect the accuracy of placement (Fig. 6). Because long bicortical screws are used, the lower loops of the Distrax should be close to the symphyseal bone, but do not have to touch the bone. If necessary, minor adjustments can be made to the lower arms during the surgical procedure. Once the surgeon is satisfied with fit of the Distrax and index, the 2mm × 12mm bicortical screws† are placed (Fig. 7). At this

†OsteoMed Corp., 3750 Realty Road, Dallas, TX 75001.

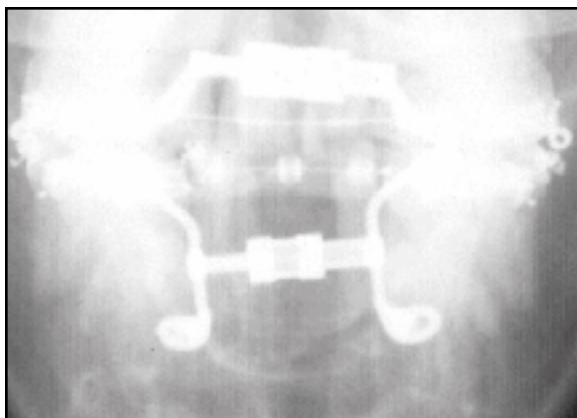


Fig. 3 Frontal x-ray indicating non-parallel vector of distraction.

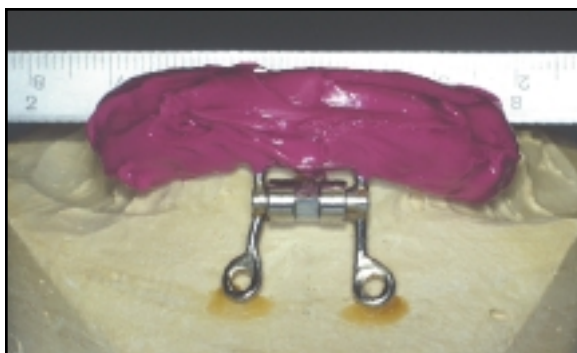


Fig. 4 Expansion screw parallel to transverse mandibular occlusal plane.



Fig. 5 Application of polyvinyl siloxane to create customized index.



Fig. 6 Seating of index and Distrax during surgery.



Fig. 7 Bicortical bone screw placement prior to index removal.



Fig. 8 Upper arm positions checked after index removal.

point, the index is cut and peeled away from the distractor so that the upper arm positions can be checked (Fig. 8). The upper arms are then secured with 24-gauge circumdental wire and a flowable light-cured composite such as Transbond LR[‡] (Fig. 9).

[‡]3M Unitek, 2724 S. Peck Road, Monrovia, CA 91016.



Fig. 9 Distrax placement completed with 24-gauge circumdental wire and light-cured composite.



Fig. 10 Intraoral verification of transverse mandibular occlusal plane.

Conclusion

Initial results with this custom-made polyvinyl siloxane index indicate a more accurate transverse vector of distraction (Fig. 10). The index also makes Distrax placement more efficient, thus reducing operating time.

REFERENCES

1. Cope, J.B.; Samchukov, M.L.; Cherkashin, A.M.; Wolford, L.M.; and Franco, P.: Biomechanics of mandibular distractor orientation: An animal model analysis, *J. Oral Maxillofac. Surg.* 57:952-962, 1999.
2. Guerrero, C.A.; Bell, W.H.; and Meza, L.S.: Intraoral distraction osteogenesis: Maxillary and mandibular lengthening, in *Atlas of the Oral and Maxillofacial Surgery Clinics*, vol. 7, ed. S.U. Stucki-McCormick, W.B. Saunders Co., Philadelphia, 1999, pp. 111-115.
3. Samchukov, M.L.; Cope, J.B.; and Cherkashin, A.M.: The biomechanical effects of distraction device orientation during mandibular lengthening and widening, in *Craniofacial Distraction Osteogenesis*, Mosby, St. Louis, 2001, pp. 131-146.
4. Samchukov, M.L.; Cope, J.B.; and Cherkashin, A.M.: The effect of sagittal orientation of the distractor on the biomechanics of mandibular lengthening, *J. Oral Maxillofac. Surg.* 57:1214-1222, 1999.
5. Grayson, B.H.; McCormick, S.; Santiago, P.E.; and McCarthy, J.G.: Vector of device placement and trajectory of mandibular distraction, *J. Craniofac. Surg.* 8:473-480, 1997.
6. Samchukov, M.L.; Cope, J.B.; Harper, R.P.; and Ross, J.D.: Biomechanical considerations of mandibular lengthening and widening by gradual distraction using a computer model, *J. Oral Maxillofac. Surg.* 56:51-59, 1998.
7. Harper, R.P.; Bell, W.H.; Hinton, R.J.; Browne, R.; Cherkashin, A.M.; and Samchukov, M.L.: Reactive changes in the temporomandibular joint after mandibular midline osteodistraction, *Br. J. Oral Maxillofac. Surg.* 35:20-25, 1997.
8. Bell, W.H.; Gonzalez, M.; Samchukov, M.L.; and Guerrero, C.A.: Intraoral widening and lengthening of the mandible in baboons by distraction osteogenesis, *J. Oral Maxillofac. Surg.* 57:548-562, 1999.
9. Guerrero, C.A.; Bell, W.H.; Contasti, G.I.; and Rodriguez, A.M.: Mandibular widening by intraoral distraction osteogenesis, *Br. J. Oral Maxillofac. Surg.* 35:383-392, 1997.
10. Del Santo, M. Jr.; Guerrero, C.A.; Buschang, P.H.; English, J.F.; Samchukov, M.L.; and Bell, W.H.: Long-term skeletal and dental effects of mandibular symphyseal distraction osteogenesis, *Am. J. Orthod.* 118:485-493, 2000.
11. King, J.W.; Wallace, J.C.; and Scanlan, D.: A new appliance for mandibular widening by distraction osteogenesis, *J. Clin. Orthod.* 35:666-672, 2001.