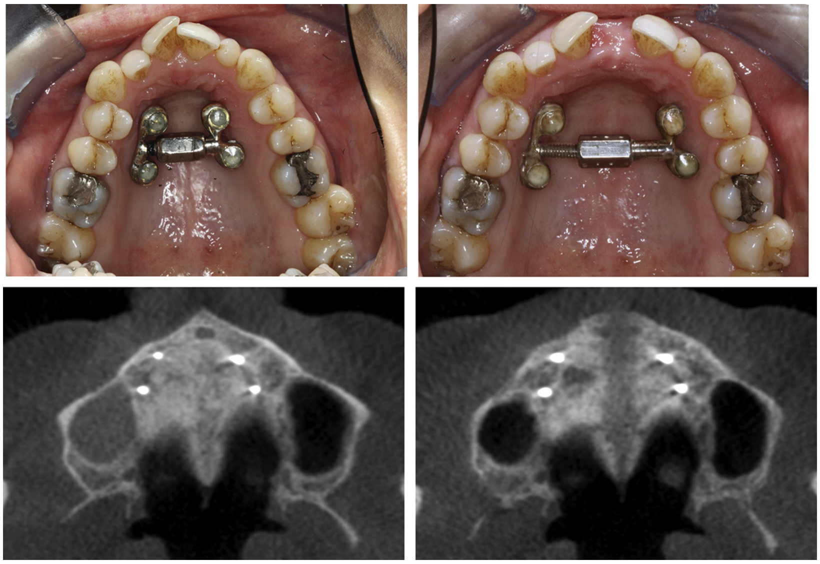

Fig. Before and after palatal expansion with pure orthodontic mini-implant borne expander (Micro4) in a woman.

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Am J Orthod Dentofacial Orthop 2017;151:3-4
0889-5406/$36.00

http://dx.doi.org/10.1016/j.ajodo.2016.09.011

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Authors' response

We agree that the term "hybrid" is appropriate if the dentition is used with the implants for anchorage for the expansion force. However, this does not mean that incorporating the dentition in an appliance design always makes it a hybrid or dental expander. If the purpose of the dentition in the appliance is not anchorage for the expansion force but something else, then the term "true skeletal anchorage" can be applied to the appliance. The expander we used, which we now officially call the "maxillary skeletal expander" (MSE), was originally designed to deliver the expansion force to 4 implants inserted deeply, engaging both layers of the cortical bone (palatal and nasal layers); the first molars were used to stabilize the position of the jackscrew during the expansion rather than for anchorage. The interlocked suture in mature patients undergoes significant torsion in 3 dimensions as it splits, and the 4 implants will undergo unnecessary strain and tip as the 2 halves of the maxilla twist away from each other. Using the maxillary molars to stabilize the jackscrew in 3-dimensional space during the expansion reduces this unwanted strain on implants, preventing breakage and loosening. Thus, this appliance can be categorized as a "skeletal anchorage device" as long as the implants are solely subjected to expansion force.

Fig 1. MSE appliance in a male patient, 18 years 6 months old.

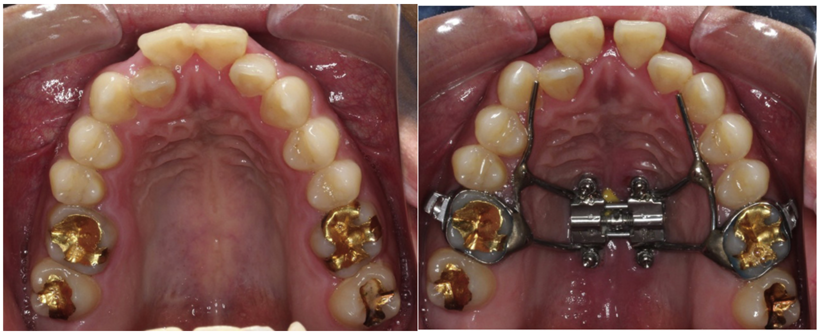

Fig 2. The MARPE appliance used in our case report was a modified version of an MSE with palatal wire extensions. Occlusal photographs before and after the suture split show that the buccal positions of the first and second molars did not change.

However, the appliance can become a hybrid if the implants fail or tip and the expansion force transfers to the molars. This can be evaluated easily by comparing the buccal positions of the dentition in contact with the MARPE against the ones not in contact. Figure 1 shows that an MSE can cause skeletal expansion without dental movements. If the expansion force is directed at first molars that are connected to the MSE, the molars would move laterally, leaving the adjacent teeth behind, since the other teeth are not in contact with the appliance. However, the relationship between the first molars and adjacent teeth did not change, indicating that the expansion was skeletal. The MARPE used in our report was a modified version of the MSE, with palatal wire extensions, making the evaluation more difficult. Figure 2 shows occlusal photographs of our patient before and after the suture split. Even here, the relative buccal positions of the first and second molars did not change. The first molars were connected to the MARPE, but the second molars were not in contact with the appliance. The right second premolar was not in contact with the palatal extension, but its relative position did not change either, indicating that the skeletal expansion occurred with no evidence of dental movement. The dental movements observed in the final records in our case report most likely occurred during the orthodontic phase of treatment, after the removal of this appliance.

The term "rapid" is important and necessary to explain the results illustrated in our case report. It is true that slow expansion is possible with this appliance as well, but the result might not be the same. Slow expansion will cause intersutural tension, and subsequent intersutural apposition of the bone might occur. However, the intersutural tension will not cumulate fast enough to break apart the interlocked bone, and the expansion force will remain within the suture. When it is done rapidly, interlocked segments of the sutural bone break apart, and an osteogenic process follows. After this distraction-like split, the lateral force will dissipate vertically and reach the zygomatic process.

Uprighting of the molars in our report was not dangerous, since this was a controlled tipping movement after true skeletal movement. We agree that spontaneous palatal tipping of the buccal teeth after bone-borne expansion is common, but only when the teeth had buccal flare before expansion.

The letter brought up an interesting point: 10 mm of expansion at the jackscrew gave 6 mm of palatal expansion, and where did the 4 mm go? This discrepancy accounts for the intersutural force required to split the interlocked bone within the suture. Initial activation cannot be linearly expressed to palatal expansion until the interlocked suture splits. Several activations are required before the jackscrew expansion and palatal split correlate with each other. Both Figures 1 and 2 showed significantly more expansion at the jackscrew than the size of the diastema. If the implants had moved through the bone, tipped, or bent as they suggested, the relative positions of the molars in Figure 1 and the teeth in contact with the MARPE in Figure 2 would have changed after the expansion. It is not likely that this occurred. The initial force loading simply dissipated within the resisting structures. If we placed this type of MARPE in solid bone, you would be able to turn the jackscrew several times before the weakest structure would give. Initial activations will not produce linear effects in suture split.

There are many born-borne expanders, and their various effects depend on their design and activation protocols. The MSE offers a unique alternative treatment modality for patients with skeletal transverse discrepancies, even at advanced ages, promoting parallel skeletal expansion of midfacial area.

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Am J Orthod Dentofacial Orthop 2017;151:4-6
0889-5406/$36.00
http://dx.doi.org/10.1016/j.ajodo.2016.10.011

Three-dimensional imaging for indirect-direct bonding could expose patients to unnecessary radiation

El-Timamy et al are commended for their June 2016 article introducing a new concept of bracket positioning using cone-beam computed tomography imaging (CBCT) and computer-aided manufacturing (El-Timamy AM, El-Sharaby FA, Eid FH, Mostafa YA. Three-dimensional imaging for indirect-direct bonding. Am J Orthod Dentofacial Orthop 2016;149:928-31).

Indirect bonding, stereolithographic trays, and CBCT technologies are undeniably valuable in orthodontic practice. The new concept introduced by the authors appears to be almost the orthodontic counterpart of the computer-guided implant placement. This is of course original.

CBCT is appealing, and when combined with other technologies, the clinician's work becomes more sophisticated. However, CBCT comes with ionizing radiation exposure to the patient. The current guidelines advise that CBCT must yield a diagnostic benefit to the patient and be justified on an individual basis.[1,2]

To expose orthodontic patients to CBCT for the benefit of computer-aided manufacturing would increase the collective effective dose for patients and ultimately cause harm to some. This is especially true when treating young patients who are particularly sensitive to radiation.[3] In addition, orthodontic treatment is highly effective presently using 2-dimensional images, and there is no evidence that 3-dimensional imaging approaches are needed to plan the average orthodontic case.[4] Furthermore, indirect bonding is quite possible without the need for ionizing radiation to execute this technique.

The ALARA principle—keeping radiation as low as reasonably achievable—prevails. With the proposed technique, a CBCT scan could indeed minimize the time, armamentarium, and expenses needed for the preparation of models, trays, and positioning devices for conventional indirect bonding techniques. However, it would not be correctly justified.

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Am J Orthod Dentofacial Orthop 2017;151:6
0889-5406/$36.00

http://dx.doi.org/10.1016/j.ajodo.2016.10.006

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