

Class II Therapy with the Mandibular Anterior Repositioning Appliance

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Fixed functional appliances have dramatically altered the therapeutic armamentarium for Class II malocclusions, and orthodontists have enthusiastically endorsed them. The newest of these appliances, and perhaps the least appreciated, is the mandibular anterior repositioning appliance. The mandibular anterior repositioning appliance does not connect the mandible and maxilla through pistons, wires, springs, coils, or other mechanisms, as do other Class II appliances. Orthodontic clinicians have considered these appliances as exclusively adolescent Class II therapies, but recent experience has shown that they can effect favorable changes in adults as well. The mandibular anterior repositioning appliance offers orthodontists and their patients an effective alternative to some of the traditional therapies for Class II malocclusions. World J Orthod 2003;4:xx-xx.

Several clinicians over the past century have noted how constant or even consistent intermittent forward posturing of the mandible can effect permanent and stable changes in the jaws and teeth.¹⁻⁸ This information has led to efficacious therapies to solve Class II malocclusions where mesial movement of the mandible and/or its teeth will reduce the sagittal discrepancy between the two jaws.

Some of the cited authors have claimed these changes attributable to greater mandibular growth, while others vigorously dispute this claim.⁹⁻¹¹ Some advocates for the augmented mandibular growth concede that close to 50% of the measured changes do proceed from dentoalveolar alterations.^{7,12} This knowledge has emboldened some clinicians to use mandibular repositioning appliances to treat adult Class II malocclusions.

Although adults experience minimal changes after adolescent maturity, they still have some growth and osseous remodeling capability,¹³⁻¹⁵ and this probably accounts for their favorable responses to therapies previously thought useful only for children or still maturing juveniles.

One of the newest and, as yet, most unappreciated mandibular repositioning appliances is the

mandibular anterior repositioning appliance (MARA). It differs substantially from other mandibular repositioning appliances in that it is permanently attached, yet does not connect the maxilla to the mandible through pistons, wires, or coils. This design allows freedom of movement not found in other appliances and contributes to greater patient acceptance.

MARA DESIGN

The MARA typically uses stainless steel crowns as molar retainers, although clinicians can successfully employ thick-walled molar bands. Ordinary molar bands will split from the occlusal pressure and jaw movement, and clinicians should avoid their use.

The maxillary crowns have a double tube soldered to their facial surfaces, ie, 0.022 or 0.018-inch edgewise tubes and large square occlusal tubes into which an adjustable cam fits. The mandibular crowns have edgewise tubes and cam followers soldered to their facial surfaces and a lingual arch that connects the crowns to one another.

The maxillary cams and the mandibular cam followers prevent the mandible from closing in a retruded or Class II position since the two parts collide to prevent ordinary and habitual closure. However, the design of the instrument encourages the mandible to move forward, and the mandibular cam follower will move in front of the maxillary cam. This allows the teeth to occlude (Figs 1a and 1b).

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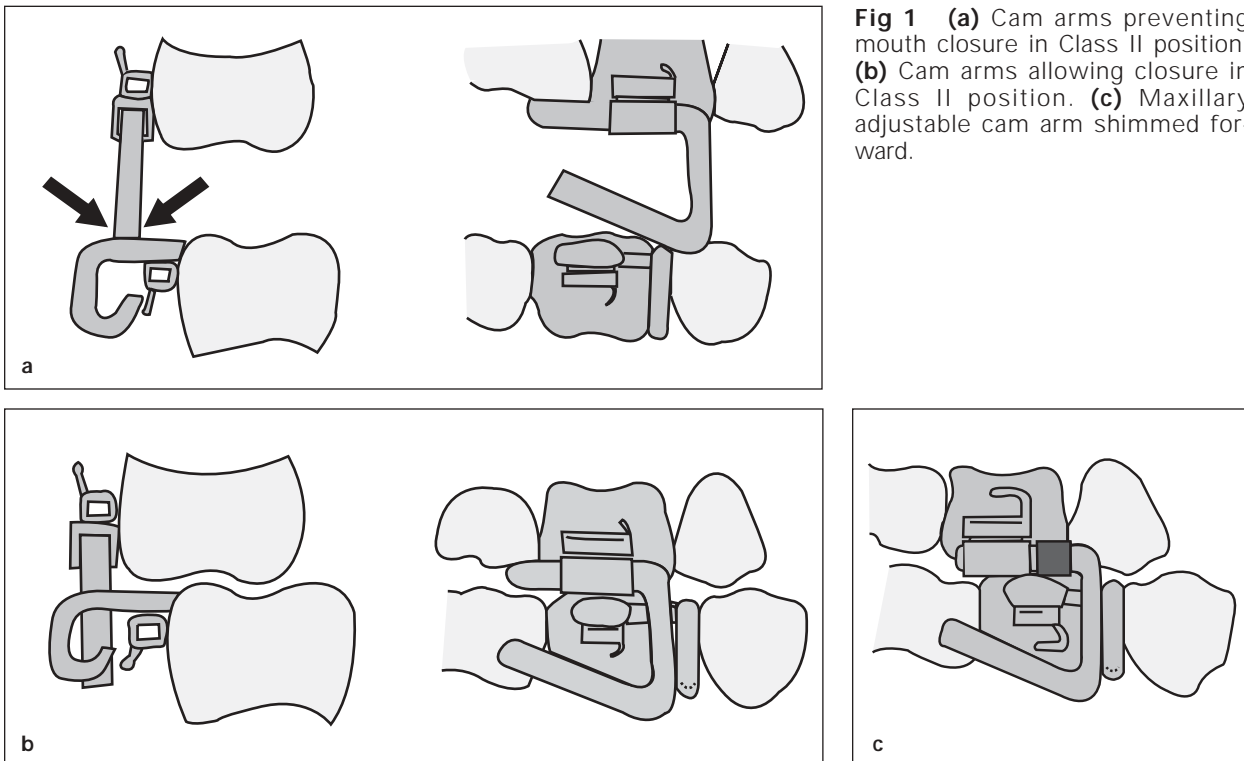


Fig 1 (a) Cam arms preventing mouth closure in Class II position. (b) Cam arms allowing closure in Class II position. (c) Maxillary adjustable cam arm shimmed forward.

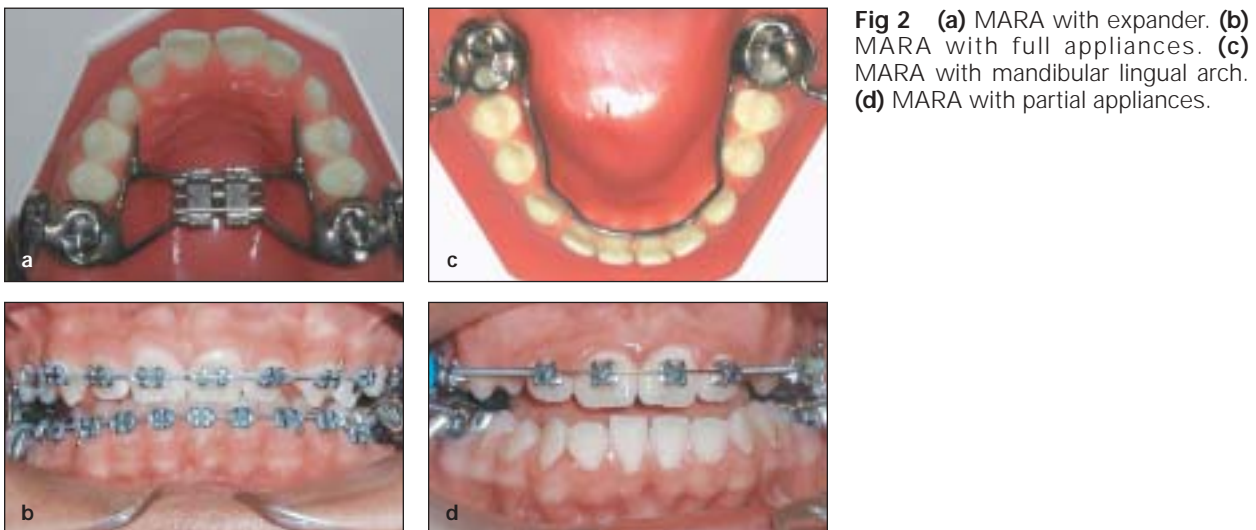


Fig 2 (a) MARA with expander. (b) MARA with full appliances. (c) MARA with mandibular lingual arch. (d) MARA with partial appliances.

Even without a physical connection between the maxillary and mandibular parts, the patient quickly learns to position the mandible forward while at rest and during function. Clinicians can select the amount of mandibular forward position by adjusting the maxillary cam with spacers slid onto the cam arm. Clinicians can help patients adjust to the MARA by providing incremental advancements rather than achieving the entire correction in the beginning. The cam spacers allow this type of slow, sequential mandibular advancement (Fig 1c).

Clinicians can combine the MARA with rapid maxillary expanders, full edgewise appliances, or partial edgewise appliances, or use it without brackets, wires, or other appliances (Fig 2).

TOMOGRAM USE WITH THE MARA

Tomograms taken of the temporomandibular joints (TMJs) before MARA placement provide a baseline with which to compare post-MARA condyles. MARA-treated patients will typically show pre- and posttreatment

condyles in the same or nearly the same positions. This could be due to osseous remodeling,^{14,16} mandibular bending,¹⁷ or possibly a combination of these and other less understood physiologic and anatomic adaptations. Regardless of how these improvements in occlusion occur, they consistently do so under the MARA influence, and they then remain stable throughout the retention phase.

MARA SEQUENCE OF TREATMENT

A general scheme for MARA use is as follows:

- The maxilla is expanded, if needed.
- Partial appliances, ie, maxillary and mandibular 2 × 4 or 2 × 6 arrangements of brackets, crowns, and wires are used to align the incisors.
- The MARA is placed.
- The MARA is removed.
- The completion of bonding and final alignment of teeth is accomplished.
- The appliances are removed and retention is begun.

CLINICAL TECHNIQUE

Orthodontists can fit the crowns or thick-walled bands on the molars and then take impressions of the maxillary and mandibular arches. Alternatively, they can elect to take the impressions of the arches and allow the laboratory to make the crown selection. Anecdotal evidence has shown that laboratory selection of crowns rivals that of clinician choice, and this technique continues to grow in popularity because of its ease of use and accuracy. The impressions are filled with plaster, and the crowns are then transferred to the plaster casts.

The orthodontist must select the desired amount of mandibular advancement and mark the casts at that point, after also aligning the midlines. A commercial laboratory, though not necessary for the MARA, is advised since these enterprises have vast and successful experience making the appliances.

The finished appliance is tried in the mouth, and the clinician makes adjustments that allow the desired mandibular advancement and midline alignment. Glass-ionomer cement (GIC) is used to fasten the crowns or bands securely to the teeth. A light-cure cement will require occlusal openings in the crowns to allow light penetration; because of this, some clinicians favor the use of dual-cure GICs.

The clinician should advise patients not to test the new appliances unnecessarily because occlusal jolts can injure the teeth and cause avoidable sore-

ness. Constant hard masticatory pressures can also loosen the crowns and break solder joints. In addition, patients should be reminded to expect a learning curve with the MARA and not to expect their bites to work flawlessly for a few days. Easily chewed foods offer the best initial diet, but patients should find few dietary restrictions after a few days.

Patients wearing the MARA can be seen as often as the orthodontist feels necessary, but the typical patient will need an adjustment no more often than every 3 or 4 months. In a typical case, the patient will wear the MARA approximately 12 months before its removal. When the posterior occlusion is firmly Class I and the condyles have good positions as observed in progress tomograms, the MARA can be removed with confidence of no relapse. At this time all unbonded teeth receive brackets, and the occlusion and rotations are corrected for final alignment.

MARA TREATMENT FOR ADOLESCENTS

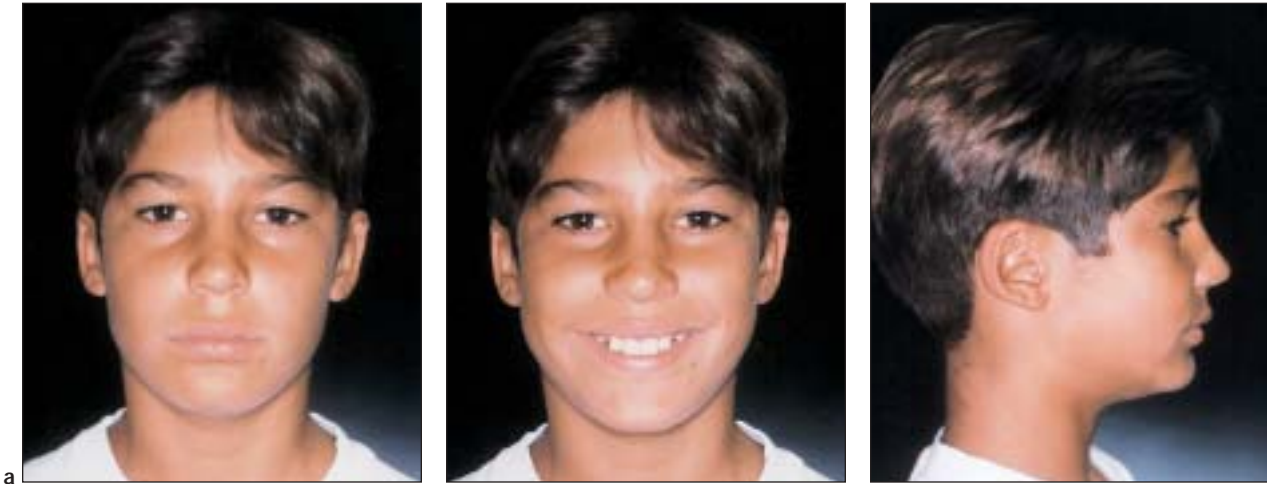
In an unpublished study of 14 MARA-treated adolescents, Dr Joseph Caruso found the following average skeletal and dental changes compared to a group of untreated control patients:

- A point moved distally 1.4 mm.
- The ramus grew 0.7 mm more than expected.
- The mandibular body extended 1.1 mm more than ordinary.
- The facial axis closed 0.5 degrees more than usual.
- The ANB angle reduced 1.8 degrees more than normal.
- The maxillary incisors moved distally 1.3 mm.
- The mandibular incisors had no change in position, but they acquired a procumbency of 6 degrees.
- The overjet reduced by 2.3 mm.
- The maxillary molars moved distally by 0.3 mm.
- The mandibular molars moved mesially by 0.2 mm.

Adolescent patients use the MARA for an average of 12 to 14 months, followed by a few months of full edgewise appliance use (Figs 3 and 4).

ADULT MARA TREATMENT

Although adults do not have the dynamic growth potential of adolescents, their dentoalveolar complexes can make favorable adjustments under MARA influence that will predictably correct Class II malocclusions. Thus far, the age of adult patients seems immaterial to MARA success (Fig 5)



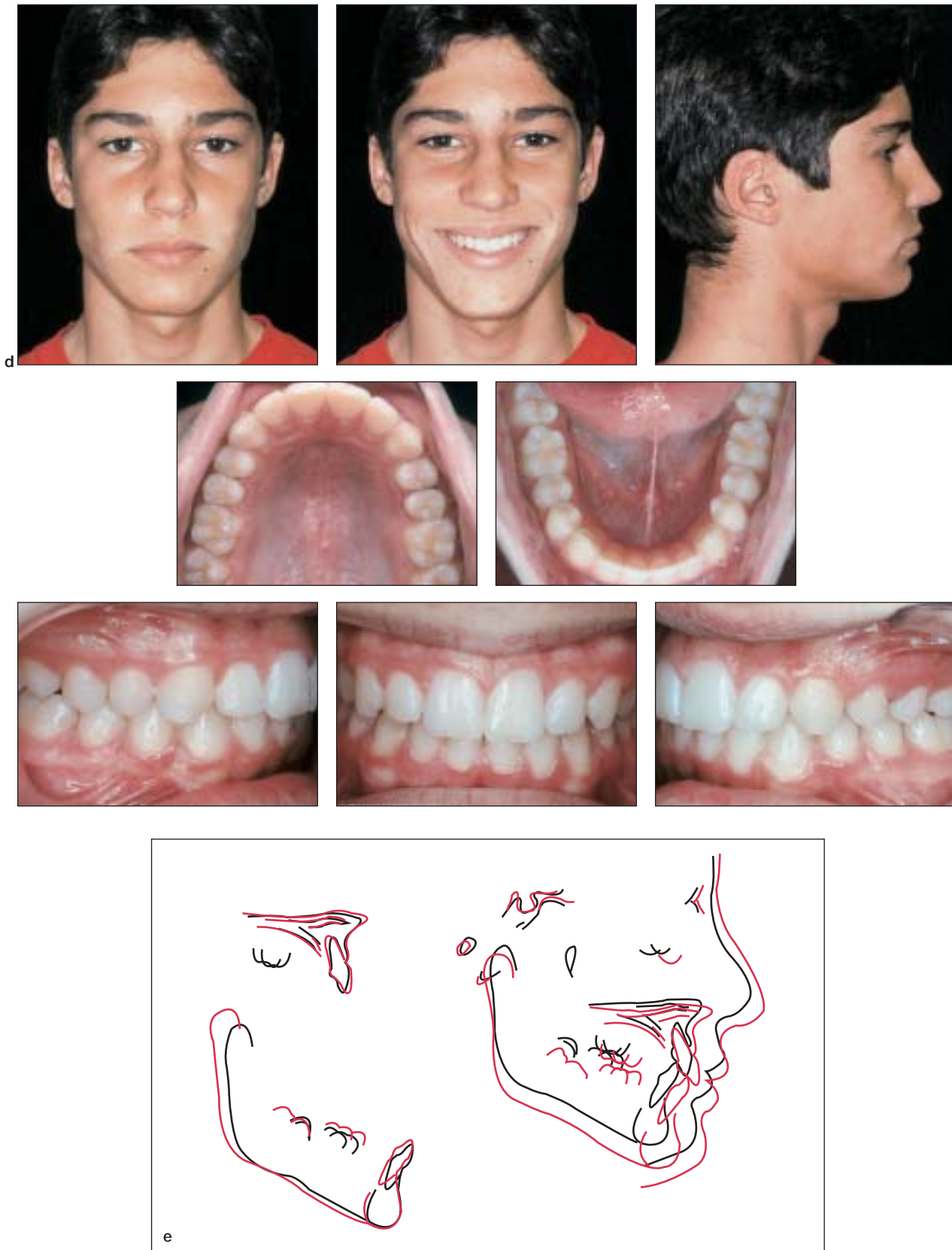
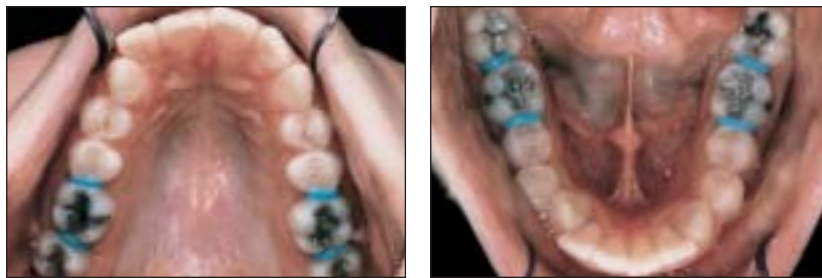


Fig 3 Adolescent patient D.L. (a) (facing page) Before treatment. (b) (facing page) With MARA and full appliances. (c) (facing page) With full appliances. (d) After treatment. (e) Cephalometric tracings.



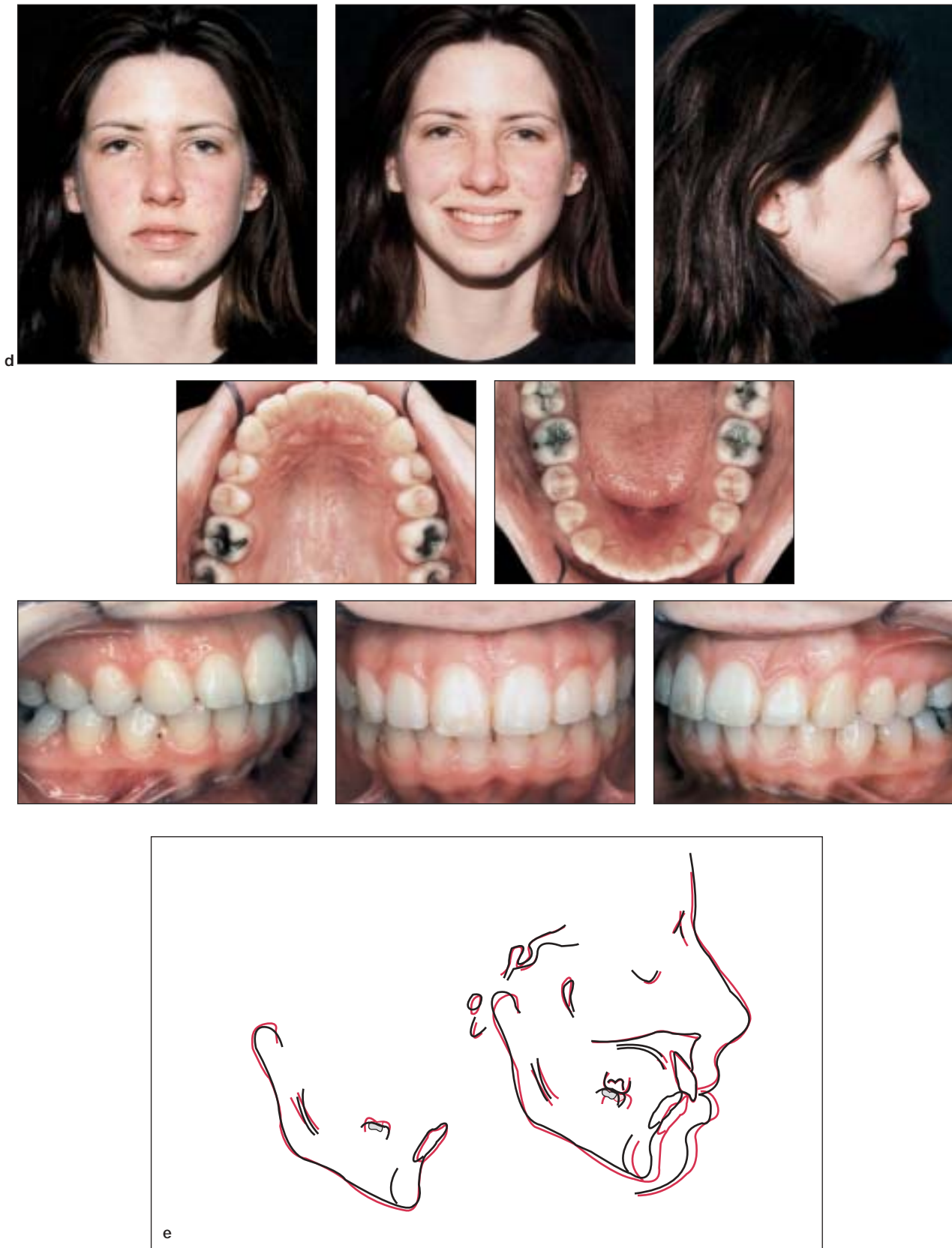
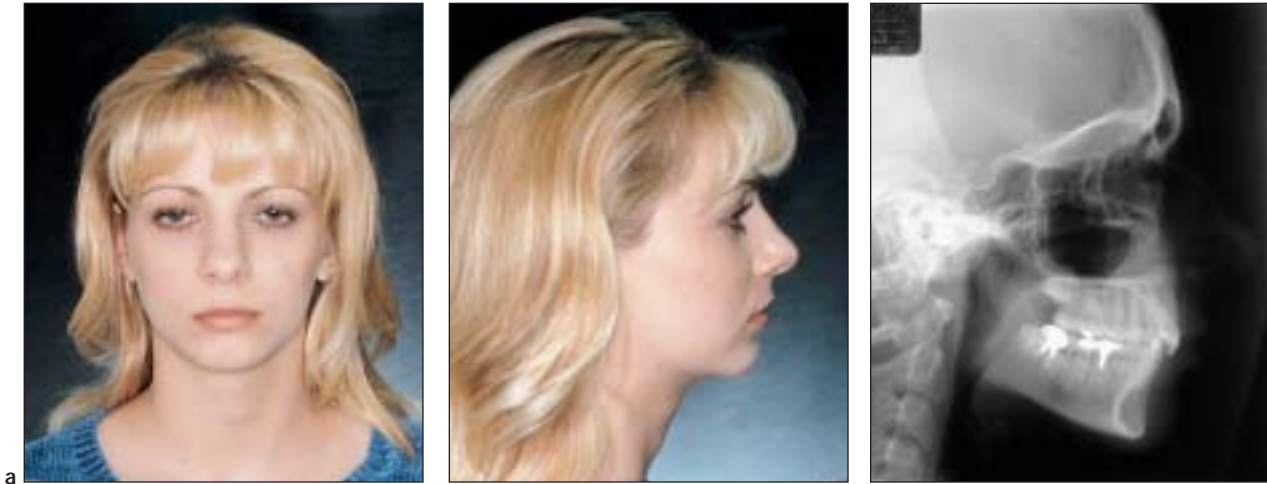


Fig 4 Adolescent patient N.A. (a) (*facing page*) Before treatment. (b) (*facing page*) In MARA and appliances. (c) (*facing page*) In MARA and appliances. (d) After treatment. (e) Cephalometric tracings.



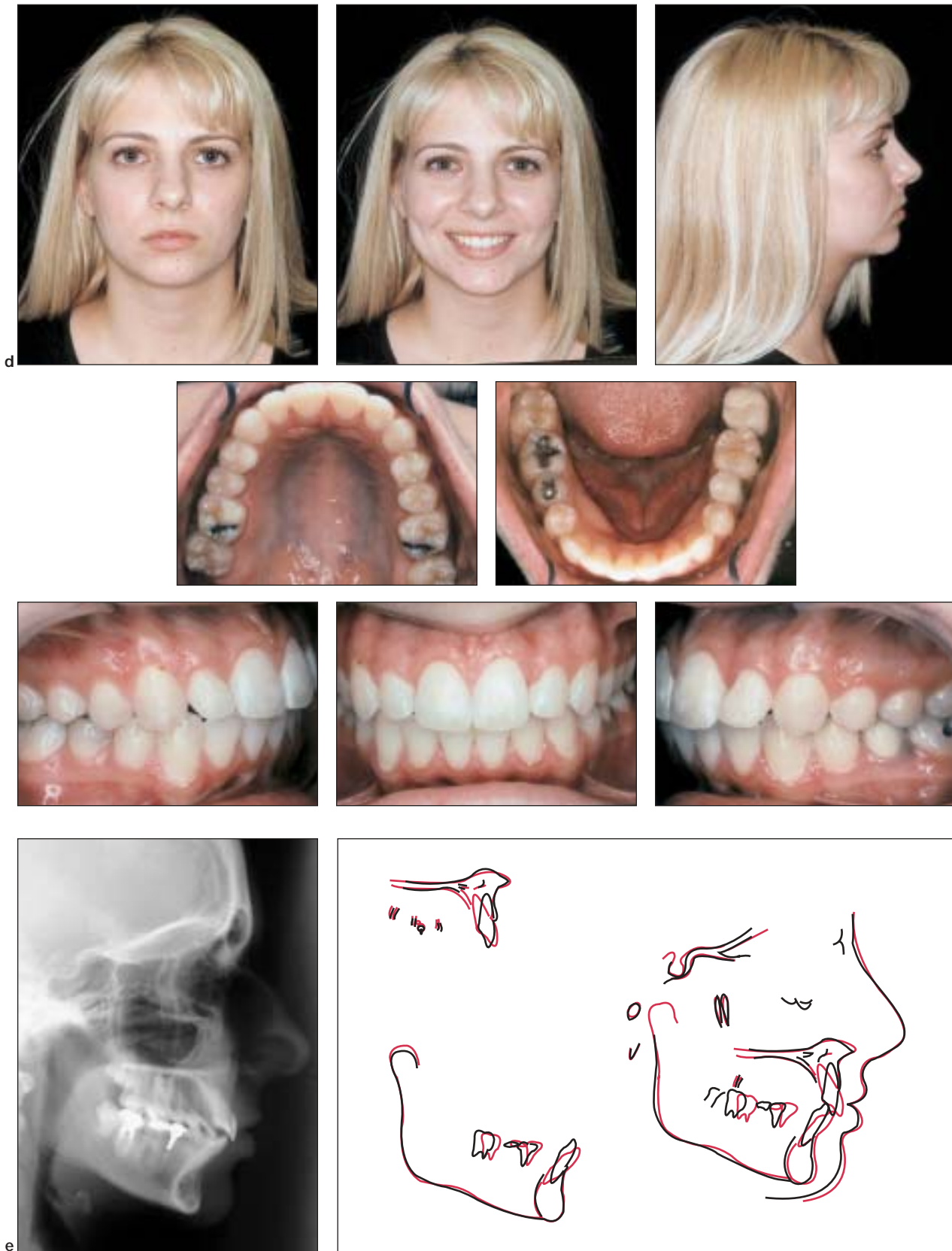


Fig 5 Adult patient C.M. (a) (facing page) Before treatment. (b) (facing page) With partial appliances and MARA. (c) (facing page) Upon removal of MARA. (d) After treatment. (e) Posttreatment radiograph and cephalometric tracings. Note distal position of maxillary molars.

CONCLUSION

No appliance offers problem-free Class II therapy, but the MARA has had high success rates with few clinical problems. The most notable advantages of the MARA are (1) the maxilla and mandible can act independently of one another; (2) patients have a greater range of motion; (3) the entire fabrication can be completed in the laboratory; and (4) the apparatus cannot be removed by the patient.

As with any appliance, there are some disadvantages. With the MARA, these are (1) a substantial laboratory investment; (2) some patients with small mouths, especially preadolescents, cannot tolerate the appliance; (3) a few patients cannot accommodate the occlusal adjustments necessary for successful therapy.

Abraham Maslow once observed that if your only instrument is a hammer, then every problem will look like a nail.¹⁸ Orthodontic clinicians need more than one instrument for the treatment of Class II malocclusions because of the variety of misalignments and the variety of patients with their own peculiarities of personality. The MARA can and does change Class II malocclusions into stable Class I occlusions that endure, and this merits further professional attention.

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