

Titanium Appliances for Allergic Patients

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Recent studies have confirmed an increasing tendency for growing patients to have allergic responses to orthodontic materials. Such a reaction usually occurs within the first 24-48 hours of appliance delivery, and has been linked to corrosion of the material. When nickel corrodes,¹ it gradually releases ions, which can act as allergens and cause a cell-mediated reaction.^{2,3} Oral allergic reactions can vary from a light mucosal erythema with or without edema to an

eczematous dermatitis or even hives.^{4,5}

The acrylic resins most commonly used in orthodontics, called MMAs, are unlikely to cause allergic reactions when they go through a complete curing process during their manufacture. Some cases of allergic reactions have been reported, however, following prolonged contact with resins containing residual surface monomer molecules due to incomplete curing.

Treating allergic patients with functional orthopedic appliances made of acrylic and stainless steel for several months at a time can be problematic. Therefore, we have developed hypoallergenic versions of the rapid palatal expander (RPE) and Frankel appliance.⁶

Because of its resistance to corrosion, titanium is highly biocompatible. In the presence of oxygen, a thin layer of oxides forms on its surface, immediately multiplying even after mechanical damage.⁷ The oxide film has an elevated density of chemical inertia that blocks oxygen flow, limiting further oxidation. This so-called “passivation” of titanium makes it an ideal metal for treating allergic patients.^{8,9} Its flexibility makes it particularly suitable for fabricating the relatively complex and bulky Frankel appliance with the required degree of precision.

Construction of Titanium Appliances

The basic steps are as follows:

1. Double impressions are taken using silicone.
2. The cast is duplicated in a refractory material for titanium casting.
3. The refractory cast is waxed.
4. The titanium is invested.
5. The appliance framework is made with a Rematitan titanium casting unit* (Fig. 1).^{10,11}

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Fig. 1 Rematitan titanium casting unit.

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6. The framework is smoothed and polished.
7. The appliance components are laser-welded together so that no other welding materials need to be added.¹² This avoids any electrochemical reactions that might result from two different metals coming in contact with saliva.¹³

The casting units and laser welders are usually found only in commercial dental laboratories, but prefabricated versions of the appliances are now available.

Rapid Palatal Expander

We used titanium RPEs* in two siblings, a 9-year-old male (Fig. 2) and a 7-year-old female (Fig. 3). In each patient, clinical examination showed increased nasal respiratory resistance, secondary hypoplasia in the maxilla, adenoid facies, and labial incompetence, and a patch test was positive for nickel.

Each RPE was activated by a quarter-turn

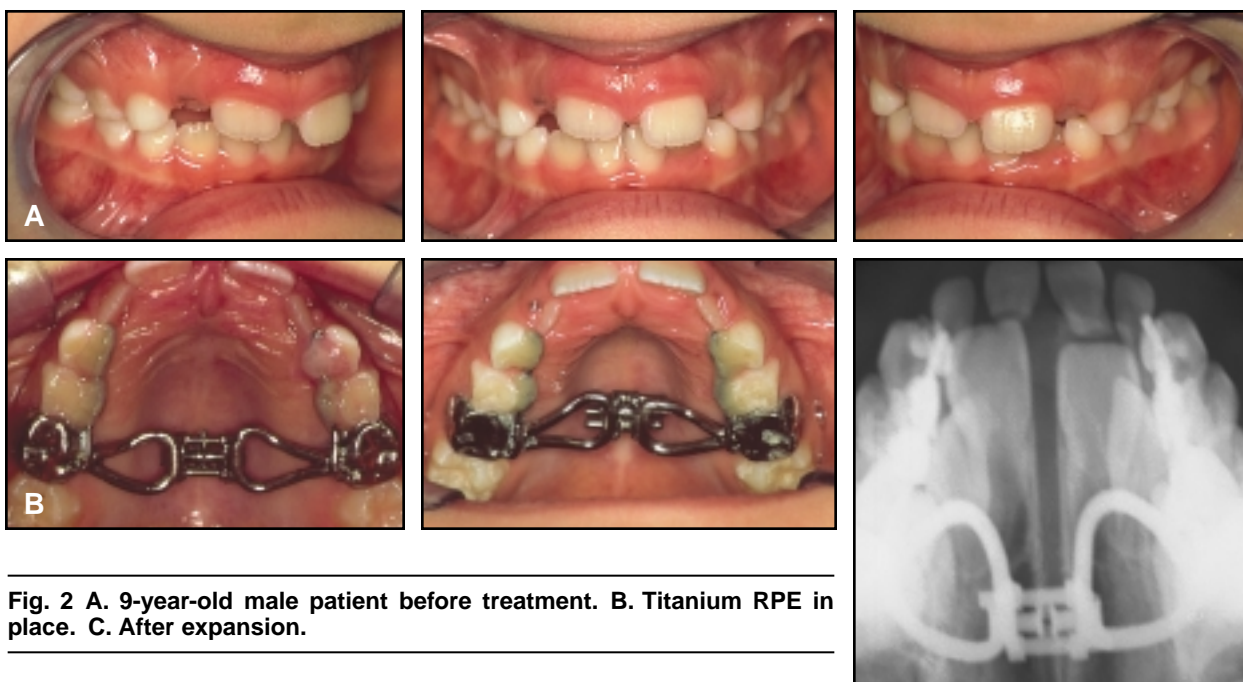


Fig. 2 A. 9-year-old male patient before treatment. B. Titanium RPE in place. C. After expansion.



of the screw twice a day for two weeks. Palatal expansion was achieved as usual, but without any allergic reaction.

Frankel Appliance

A 10-year-old female presented with a slight skeletal Class III tendency marked by an excessive lower vertical dimension. Her arch widths showed normal development, but a mild sagittal deficiency was clinically evident in the paranasal areas.

A Class III Frankel appliance was prescribed to be worn for one year, until the end of the growth spurt (Fig. 4A). Although the appli-

ance was initially worn only at night, after about 10 days the patient complained of an extensive rash and blistering around the lips (Fig. 4B). The lesions were diagnosed as allergic.

After a titanium Frankel appliance** was constructed and placed (Fig. 4C), the perilabial lesions gradually disappeared.

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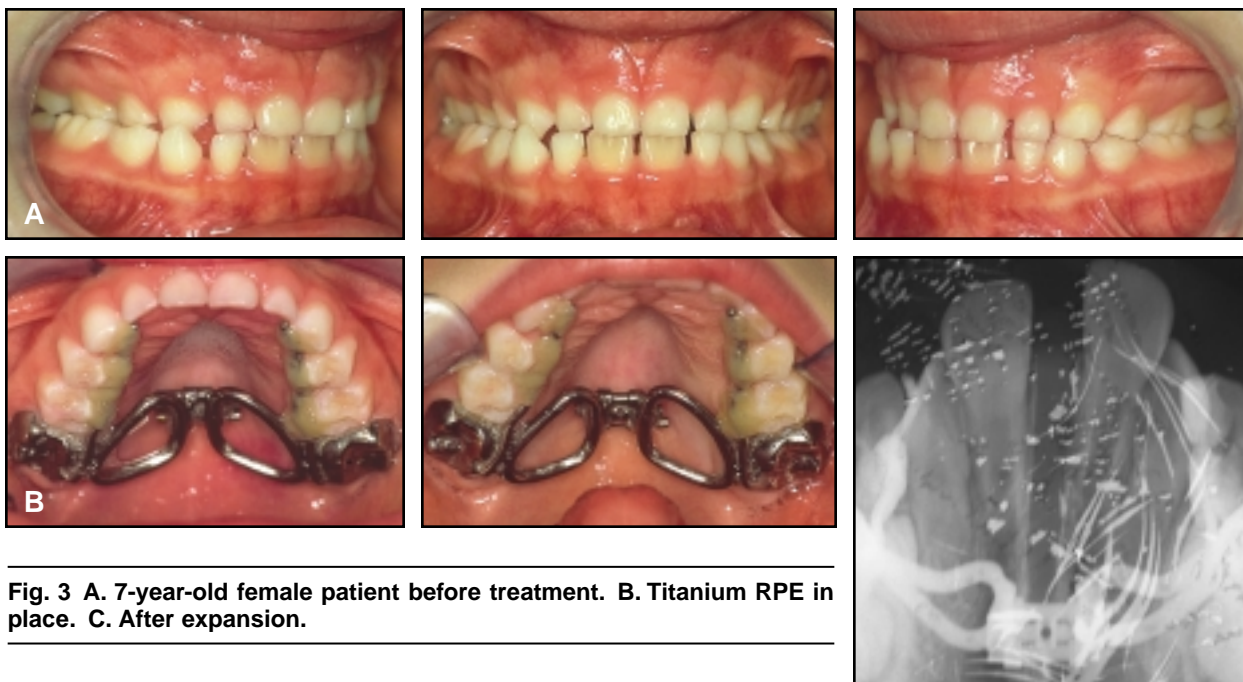


Fig. 3 A. 7-year-old female patient before treatment. B. Titanium RPE in place. C. After expansion.





Fig. 4 10-year-old female patient with skeletal Class III tendency. **A.** Initial Frankel appliance. **B.** Perilabial ulcerous lesions. **C.** Titanium Frankel appliance.

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