

CLINICAL SECTION

Breakages using a unilateral fixed functional appliance: a case report using The Forsus™ Fatigue Resistant Device

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Fixed functional appliances are designed to provide a simple non-compliant solution to orthodontic Class II treatment. Molar correction can be achieved very quickly using these appliances, but the clinician should be wary of unexpected breakages. This case report documents such an occurrence using a unilateral fixed functional appliance.

Key words: Forsus Fatigue Resistant Device, unilateral Class II correction

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Introduction

Unilateral Angle Class II malocclusions occur in approximately 16% of the population, with two-thirds of those cases occurring on the right-hand side.¹ Over the past few years, treatment plans involving non-extraction treatment and non-compliance therapies have become increasingly popular.² A non-extraction approach often requires distal movement of maxillary molar teeth so as to achieve the Class I molar and canine relationship, and for many years, headgear was used routinely for unilateral distal movement of maxillary molars.³ This treatment regime not only relied on good patient co-operation, but also had a tendency to generate unwanted lateral forces, leading to a unilateral cross-bite.^{4,5}

Since the reinvigoration of the Herbst Appliance by Pancherz⁶ in the 1970s, many different non-compliant variants have come onto the market.⁷ They claim to allow greater freedom of movement of the mandible and allow lateral jaw movements to be carried out with ease. The major drawback with these appliances is the propensity with which fractures can occur, both in the appliance itself and in the support system.

Forsus™ Fatigue Resistant Device

The Forsus™ Fatigue Resistant Device (3M Unitek, Monrovia) is an innovative three-piece telescoping

spring for Class II correction. It consists of a universal spring module, an 'L' pin and a push rod that is available in five different sizes (Figure 1). It is assembled so that the appropriately sized push rod attaches directly to the lower archwire distal to the canine teeth, and the spring to the headgear tube via the 'L' pin. Assembly usually takes a few minutes per side.

The Forsus springs require anchorage preparation before they can be placed to minimize unwanted movement. It is necessary to align and level arches prior to insertion of the device with a minimum of 0.016 × 0.022-inch stainless steel (SS) required in a 0.018-inch slot, or a 0.019 × 0.025-inch wire in a 0.022-inch slot. The archwires should be tightly cinched and lower canines tied into the archwire with steel ligatures.

The appliance places a distal force on the upper arch and a mesial force on the lower arch, allowing for Class II correction. Incremental forces can be created by placing 2-mm split crimps onto the push rod, increasing the pressure on the spring.

A literature review was conducted using Medline (PubMed) and no articles were found pertaining to the use of this appliance.

Case report

A 13-year-old female presented with a dental Class II division 2 malocclusion. The overjet was 6.5 mm and the

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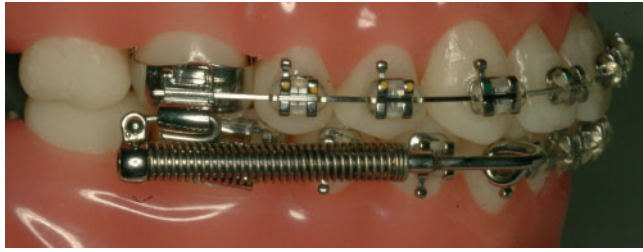


Figure 1 The Forsus™ Fatigue Resistant Device

overbite was 50%, with the maxillary midline coincident with the facial midline and the mandibular midline 3 mm to the right of the facial centreline. The upper right central incisor had slipped contact and overlapped the upper left central incisor. The upper right canine and lateral incisor were mesiopalatally rotated, and the upper right posterior teeth had migrated mesially. Consequently, the patient displayed a Class II molar relationship on the right (Figures 2 and 3).

The goal of orthodontic treatment was to reduce the overjet and overbite, and correct the molar relationship to Class I on both sides, using a non-extraction approach. It was decided that a unilateral Forsus™ spring would provide the mechanics necessary to achieve our aims.

Fixed pre-adjusted (0.018-inch Wick–Alexander prescription, RMO, Denver, Colorado) appliances were placed with headgear tubes on the upper molar bands. An initial 0.014-inch round nickel titanium archwire was used for levelling and alignment of both arches, with heavily rotated teeth ligated in with 0.010-inch SS ligatures. Two months later, upper and lower 0.014-inch

round steel wires were placed with appropriate bite-opening curves.

After 13 weeks, enough levelling and aligning had occurred to place 0.016 × 0.022-inch SS wires in both arches, and these were cinched tightly. A Forsus™ spring was fitted to the right-hand side with a 25-mm push rod, according to the manufacturer's guidelines. The lower right canine was ligated to avoid elastic ligature breakage and to secure the arch-wire to the bracket.

One month later, 0.0175 × 0.022-inch SS wires were placed in the upper and lower arches and a split crimp was inserted on the push rod. The patient returned 12 days later with the 'L' ball pin fractured and the split crimp missing. The patient stated that they had swallowed the crimp. A new pin and split crimp were placed. At the next scheduled appointment, a further split crimp was added to reactivate the appliance.

Five-and-a-half months into treatment (2½ months after placement of the appliance), the patient returned again with a breakage (Figure 4). This time, the pre-welded molar tube had sheared off from the band (3M Unitek, Monrovia, USA). All broken parts were accounted for. Since the full unit Class II molar correction had been achieved in 2 months, a decision was made to remove the Forsus™ spring. Final arch coordination and detailing was completed with the same archwires and light Class II elastics. Treatment was finished at 9½ months, with all treatment objectives met (Figure 5). The lower dental midline was coincident with the upper dental midline as well as with the facial midline.

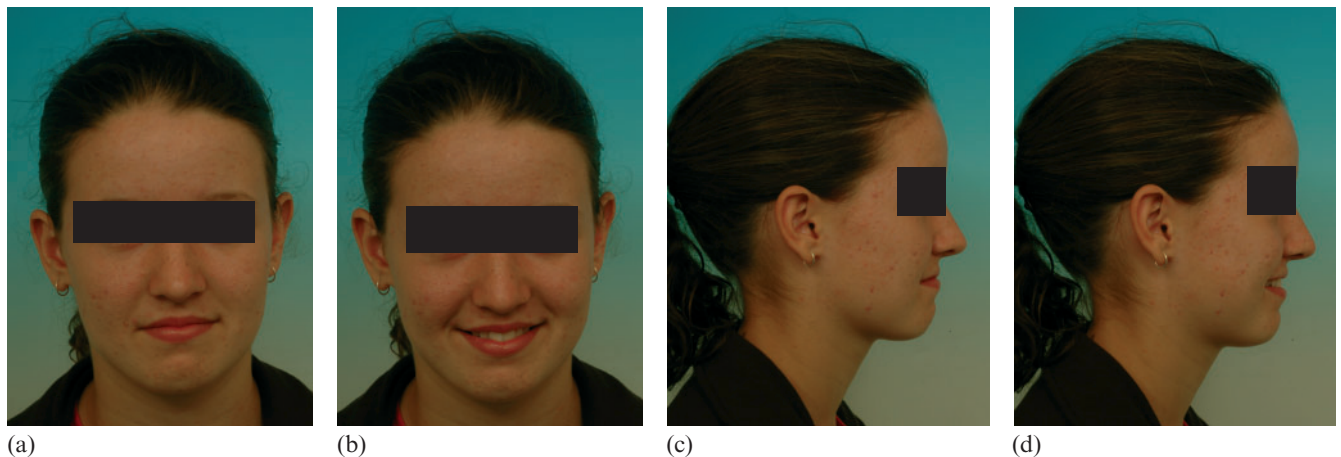


Figure 2 (a–d) A 13-year-old female patient with unilateral dental Class II division 1 malocclusion before treatment. Pre-treatment photographs: extra-oral

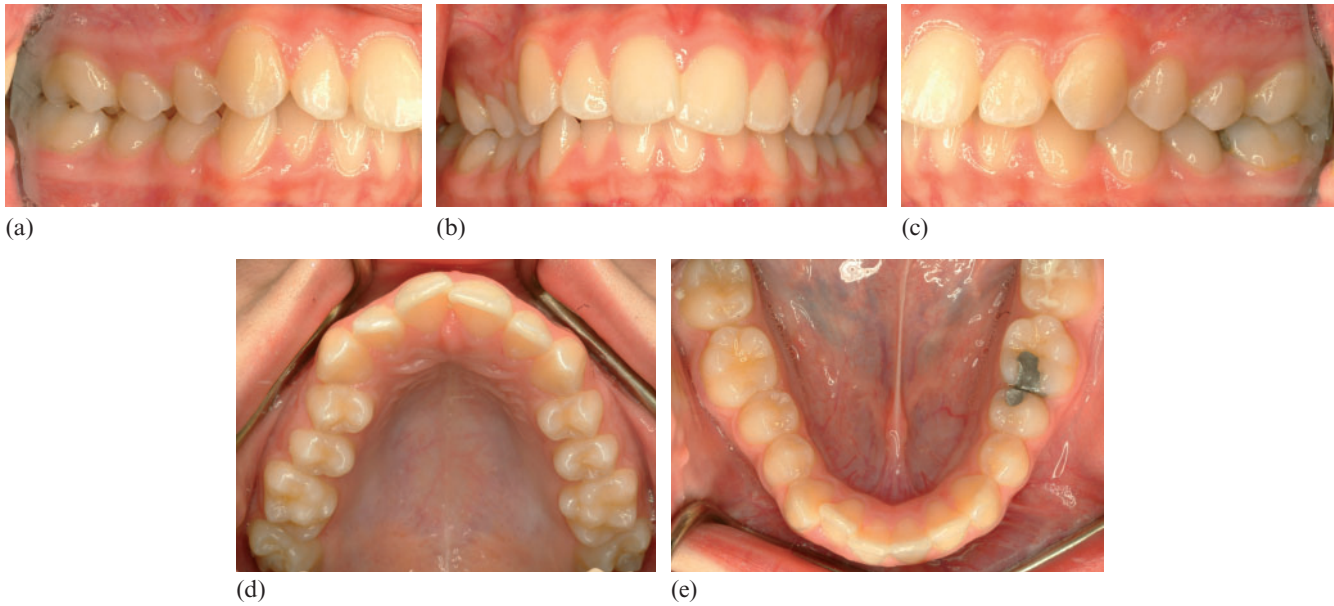


Figure 3 (a–e) A 13-year-old female patient with unilateral dental Class II division 1 malocclusion before treatment. Pre-treatment photographs: intra-oral

Discussion

While the concept of non-compliant appliances may seem attractive to the practitioner, one must question what non-compliance actually means. Compliant can be defined as ‘ready to yield to the wishes or desires of others’.⁸ These appliances remove the need for a patient

to comply, but when faced with constant repair and monitoring of breakages, they may instead transfer the compliance to the practitioner.

The case detailed above highlights a potential fault inherent in the unilateral fixed functional appliance. The unilateral spring provided the necessary mechanics to achieve the treatment aims in 9½ months, well ahead of

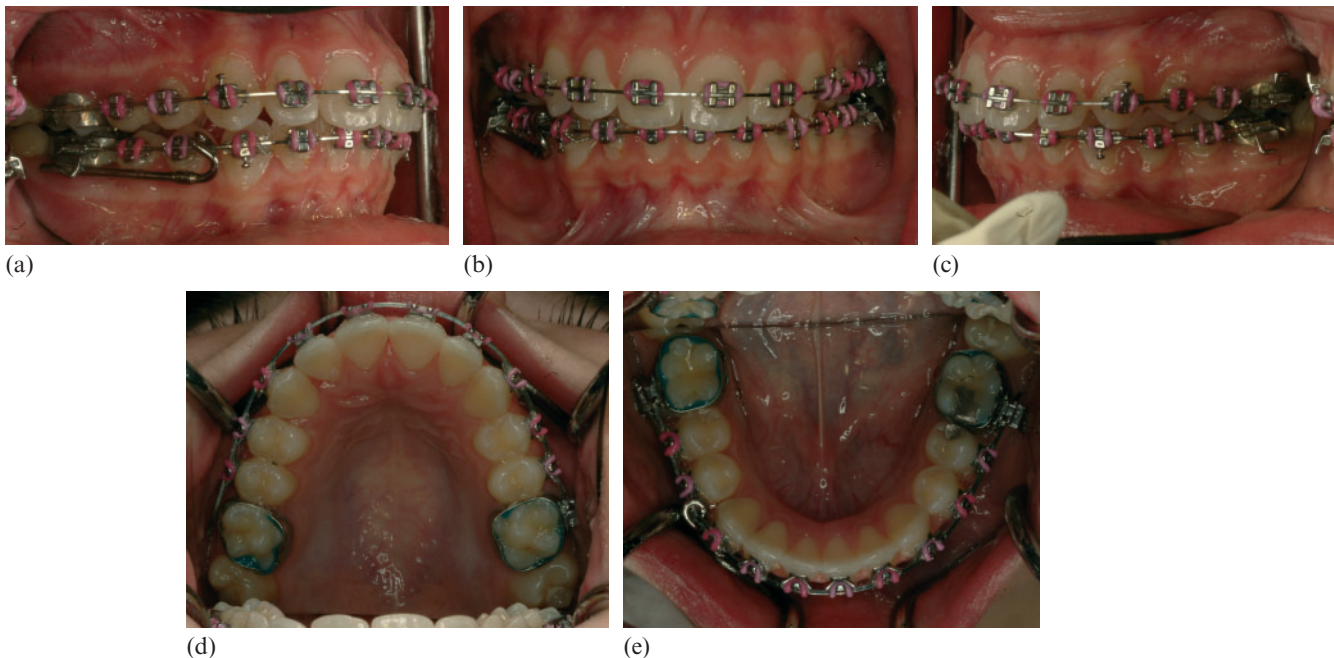


Figure 4 (a–e) Patient after the Forsus™ spring sheared the pre-welded tube off the upper molar band. The spring and tube were removed from the mouth for safety reasons

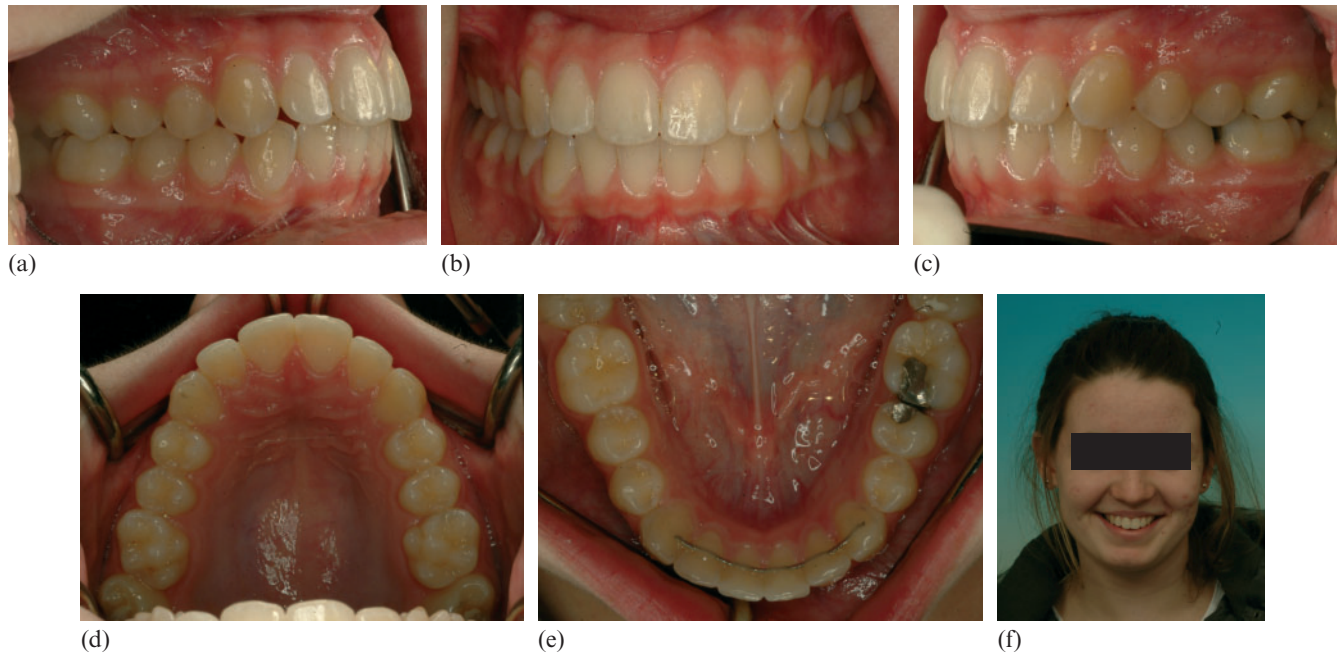


Figure 5 Patient after treatment. (a–e) Post-treatment photographs: intra-oral. (f) Post-treatment photograph: extra-oral

the estimated 18 months. This time saving came at a price of two breakages and the possibility of inhalation of unsecured components. In this particular instance, the breakage had occurred at an unknown time period prior to attendance at the clinic, with the patient reasonably certain that the object had been swallowed. There were no signs or symptoms of concern, and given the small, smooth nature of the missing object, it was deemed unnecessary to pursue the matter further. This is in keeping with the recommendations of the British Orthodontic Society Advice Sheet 9, 'Guidelines for the management of inhaled or ingested foreign bodies'.⁹

The breakage incident was reported to the manufacturers, and the remaining portion submitted for analysis. In our department, we have so far placed 17 springs (five bilaterally and seven unilaterally), with the following breakages: eight lost split crimps, one broken 'L' pin, and one broken pre-welded molar band.

Conclusions

Breakages are an unfortunate part of orthodontic treatment. Non-compliant appliances attempt to limit one aspect of treatment problems, but can sometimes create other unwanted effects that can be potentially dangerous to the patient. The practitioner should be wary that their treatment plans may not be solving problems, but substituting for them instead.

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