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Trial of a new rapid palatal expansion screw

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Introduction

Rapid palatal expansion has been a well-established procedure in orthodontic practice for many years now.

The first expansion was performed in 1860 by Emerson C. Angell, who, in San Francisco, expanded the maxillary arch of a fourteen-and-a-half-year-old girl by a quarter of an inch in 2 weeks and noted the creation of an interincisal diastema, a sign that the expansion of the palatal suture had occurred. This expansion was published in Dental Cosmos San Francisco Medical Press in 1860.

Different types of screws and activation protocols have been developed over the years.

In the following project, we tested an innovative screw, the characteristics of which allow for safe and effective activation, the quantity of which can be easily controlled.

External examination of the screw (Figs. 1a & b)

- Compact in appearance (7.5 x 12 mm) with rounded edges and a very smooth structure.
- The small screw cylinder has four teeth for preventing return.
- Small casing to prevent the screw from unwinding.
- Notches for controlling the amount of activation: each notch corresponds to 2 mm of activation.
- Stopping pins which firmly block the [Expander] once opened.

This device prevents complete separation of the screw, with its subsequent disconnection and accidental opening of the two parts of the Expander.

Bench testing (Figs. 2a & b)

The opening of the screw with the special key was tested. The direction of activation is clearly indicated

Figs. 1a & b: External examination of the screw.

Fig. 2a: Screw activated at 4 mm.

Fig. 2b: Screw activated at 8 mm – note the stopping device.





with a very visible arrow printed on the body of the Expander.

The screw is activated by turning the key as far as it will go. At the end of each activation a loud click sound is heard, which is made when it meets the braking ring, provided with the device. The braking ring prevents the screw from unwinding when the activation screw is removed. This ensures the screw has been activated correctly and allows for the simple reinsertion of the key at the next activation, leaving the insertion hole perfectly accessible.

There are notches for controlling how much the Expander is activated.

The first two notches are stamped onto the body of the Expander, while the others are stamped on the concentric sliding guides. The latter notches are therefore visible during activation while the screw is opening.

The notches are positioned 2 mm apart from each other.

Each activation moves the screw forward by 0.2 mm, corresponding to a 1/4 turn of the total circumference of the screw.

The screw is therefore particularly stable for the whole expansion process; this is thanks to the double concentric sliding guide, which is one of the peculiarities of this Expander.

The Expander remains stable until its maximum opening limit is reached, at which point it blocks without disconnecting the screw itself, thanks to a solid stopping device. This means it is possible to take advantage of the full length of the screw in absolute safety.

Clinical test (Figs. 3a–e)

We tested the Expander on a 5-year-old patient with a left-sided cross bite. We wanted to choose a very young patient with a very small palate, given that it is mainly in these patients that difficulties are most frequently encountered when activating the screws. These difficulties are linked to the confined spaces available for operating in. As a result, when the parent removes the key after activating the screw, he/she almost always tends to bring the screw back again, reducing how much they have activated it by. As a result, it is difficult for the clinician to evaluate the real amount of expansion.

Activation protocol

The Expander was bonded to two bands and cemented onto the second deciduous molars and the rapid expansion protocol was implemented, which provides for the activation of the screw twice a day (Figs. 4a & b).

We asked the parents to do this themselves, but remained contactable at all times for anything they needed or in case of emergency.

Figs. 3a–e: Five-year-old patient with left-sided cross bite.

Figs. 4a & b: The Expander was bonded to two bands and cemented onto the second deciduous molars. Figs. 5a & b: On the 14th day we terminated activation as the pre-determined expansion level of 5.5 mm had been reached.





Fig. 6: The Expander remained blocked in the mouth for 1 month and was then replaced with a Quad helix.

The patient was examined after one week. The parents reported that they had noted the creation of an inter-incisive diastema on the 5th day, as is generally the case at this age, from our experience.

We discharged the patient after having personally activated the screw to check its stability and the efficacy of the stopping device.

On the 14th day, we terminated activation as the pre-determined amount of expansion of 5.5 mm had been reached (Figs. 5a & b). The correct amount of activation was confirmed by the reference notches. As you can see from the photo, the third notch is about to appear, indicating 6 mm, but is still slightly hidden by the sliding guide, while the two previous notches are clearly visible on the body of the Expander.

The Expander remained blocked in the mouth for 1 month and was then replaced with a Quad helix (Fig. 6), which includes a marker for lingual repositioning.

The Quad helix remained in the mouth for another 4 months, after which no other type of restraint was required. This protocol provides for the replacement of the rapid expander with a Quad helix 1 month after the end of activation. It is a protocol we have been using for more than 20 years and has been tested on more than a hundred cases, proving to be particularly effective and free of any contraindications.

In fact in our opinion, 1 month is more than enough for the consolidation of the midpalatal suture, given that this is the average time required for the consolidation of fractures.

The replacement of the Expander with a Quad helix provided with a lingual marker offers the follow-

ing advantages: it reduces the encumbrance to the palate. In fact, often owing to its encumbrance, the rapid Expander forces the tongue into a low, forward position, with a subsequent open bite from lingual dysfunction.

As well as maintaining the breadth obtained with the rapid expander, the Quad helix can also increase it, by activating it by the required amount.

Thanks to the lingual marker, together with the modest encumbrance to the palate offered by the Quad helix (note its modelling in the photo), myofunctional re-education can be initiated immediately. This is definitely more important, in terms of the stability of the expansion and the prolonged use of the expander as a maintenance guard, given that the same prevents correct lingual repositioning, an indispensable condition for the stability of our treatment in the long term.

In addition, since it is an elastic device, the Quad helix does not block the two hemimaxillae together, thus allowing the jaw to adapt to the occlusal forces, certainly a useful condition for the cranial architecture, which is also welcomed for osteopathic treatment.

Conclusions

In both bench and clinical testing, the Expander has proven to be extremely precise, assembled with care, solid and without any flexion.

The parents of the patient activated the screw at home with particular ease and precision, thanks to the braking device. In fact this feature enabled them to hear a 'click' upon each activation, and above all to not turn the screw back when removing the key, thus undoing the activation they had just completed. This is such a frequent occurrence during the activation of traditional Expanders. The whole process went ahead without any problems and with the maximum level of comfort for the young girl, thanks also to the compact size of the Expander, permitting effective and safe use in very young patients.

The arm and the screw of the Expander were proven to be precise and without any flexion. The reference notches printed on the screw enabled the clinician to check that the activation had been performed correctly. All this resulted in a greater sense of security for both the patient and the therapist, as well as being appreciated as an indicator of a high level of professionalism.

Editorial note: A complete list of references is available from the publisher.

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