

The Orthodontist Dr. R.H.A. Samuels

Dr. Russell Samuels is a Consultant Orthodontist at the Glenfield Hospital, University Hospitals of Leicester in England. He is also in private practice in the same city. He has had an interest in headgear (extra oral traction) safety since 1990 when he was first asked to provide advice in a legal case involving a facebow injury to a patient. Since then he has been involved in research projects to discover why patients have been injured by this device and how safety devices should work if they are to help prevent injuries in the future.

Having established the causes of the facebow injuries Dr. Samuels felt it was necessary to change the design of the standard facebow. He spent several years designing and testing different locking and retentive mechanisms on facebows to improve their safety for his patients. Dr. Samuels has used locking facebows of one sort or another on his patients for over 10 years. The early work eventually led to the design and the commercial availability of the Nitom² Locking facebow™. This facebow design was tested in a large study on 697 patients by 12 Orthodontists over a two year period to check its performance. Results demonstrated a huge improvement over the simple standard facebow. Since this study further work to improve the design has led to the Nitom² Locking facebow™ which is now available to all orthodontists world wide.

The Nitom² Locking Orthodontic Facebow™ and why you as an Orthodontist would want to use it

Dr. R. H. A. Samuels

Since 1947 when Silas Kloehn soldered the inner to the outer bow to create the now familiar standard facebow, extra oral traction (either with a headcap or neckstrap) has been used with this facebow to provide valuable additional anchorage to help treat a variety of malocclusions. Despite the increased interest in "non compliance" appliances and implants it still continues to provide invaluable anchorage for a variety of malocclusions. It is both clinically effective and cost effective.

However, unfortunately there have been a few case reports of soft tissue injuries caused by the facebow in the dental and medical literature in the past 25 years. To determine the aetiology of the injuries two questionnaire studies were carried out in Europe. In the first study, a letter of inquiry was sent to the Orthodontic Societies and Orthodontic units of the Dental Schools in 23 European countries requesting any information on facebow injuries that were known to have occurred. Details of 9 injuries were returned. In the second study a questionnaire survey was sent to 1117 active Orthodontic practitioners in the UK and Eire requesting any information on facebow injuries. From 859 practitioners using headgear details of 33 injuries were reported with the majority occurring at night. These injuries ranged from minor lacerations to the loss of an eye.

The information acquired from these two studies and the case reports revealed that the

injuries were caused by either the catapult effect of the elasticated extra oral traction (rubber bands or elastic material) or the facebow becoming dislodged from the buccal tubes at night when the patient was asleep. The causes can also be further subdivided into 4 categories shown below.

Aetiology of the Injuries:

1. Accidental disengagement of the facebow when the child was playing whilst wearing a standard facebow and simple elasticated extra oral traction. The facebow was knocked out of the tubes and recoiled back hitting the patient.
2. Incorrect handling by the child during the fitting or removal of the standard facebow and simple elasticated extra oral traction. The child attached the facebow to the elasticated traction and as a single unit slide the facebow over their head while attached to the elasticated traction. The facebow slipped from their grip and recoiled back and hit the patient.
3. Deliberate disengagement (pulling) of a standard facebow used with simple elasticated extra oral traction, by another child. Another child pulled the facebow out of the tubes and let go allowing the facebow to recoil back due to the elastic traction and hit the patient.
4. Unintentional disengagement or detachment of a standard facebow used with either simple elasticated materials or self release extra oral traction when the patient is asleep. The headcap or neckstrap either comes off or are removed at night and the facebow is then free to come out of the buccal tubes and ends up in the bed. The patient unaware of this rolls onto the facebow and is injured by the pointed ends of the inner bow.

The relevance of the oral micro-organisms to the soft tissue injuries:

This factor is often over looked when assessing safety issues.

The presence of oral micro-organisms on the ends of the inner facebow has a huge significance in these injuries because this invariably means the soft tissue injuries become infected. This greatly alters the prognosis of any soft tissue injury caused by the ends of the inner bow. Patients who have experienced an eye injury at night have reported that there is usually minimal discomfort which fails to alert the children to seek attention immediately. This delay in treatment allows the infection to spread rapidly with disastrous results. The eye is an excellent culture medium and can be difficult to treat successfully with appropriate antibiotics. When only one eye is injured the other eye can still be at risk from contra lateral endophthalmitis.

Safety devices:

The risk of injury to a patient may be small, but all patients should be protected against a known risk however small.

Several devices are currently available aimed at improving extra oral traction safety. These include self releasing extra oral traction systems on headcaps and neckstraps, plastic neckstraps, shielded facebows and locking facebows.

When assessing these devices we now know that to be effective, any of these devices have to prevent the catapult effect of the extra oral traction (rubber bands) and the facebow dislodging from the buccal tubes while the patient is asleep.

Self releasing systems:

Self releasing modular systems are aimed at preventing the catapult effect of the extra oral traction by limiting the travel to a minimum before disengaging the traction. The minimum amount of travel required for high pull headgear is approximately 10 mm per side to allow the straps to be extended and attached to the outer bow hooks without releasing the modules. However for cervical traction the travel in the straps will need to be greater to accommodate the change in distance between the back of the neck and the facebow as the head moves. From measurements made on 9 to 14 year old children it was found that the average strap extension will need to be 25 mm per module. However, neither the self releasing modular system or the simpler elasticated materials (rubber bands) can be relied upon to consistently maintain a standard facebow within the buccal tube.

Stiff plastic neckstraps:

Stiff plastic neckstraps have been offered as a simple safety device, but are confined to cervical use only. Because this device is made of stiff plastic it cannot comfortably accommodate the changing distance between the back of the neck and the upper first molar as the head moves. This makes it an unsuitable device to provide a continuous resistance to the displacement of the facebow from the tubes.

Shielded facebows:

Shielded facebows may reduce the severity of some trauma but the inner ends whether shielded or not will still be covered with oral micro-organisms. It is the presence of these micro-organisms that significantly alters the outcome of eye injuries rather than the trauma per se. This factor significantly compromises the safety capability of this facebow design.

The Nitom² Locking Facebow™:

The self releasing systems and stiff plastic neckstraps cannot, and are not designed to maintain the facebow in the buccal tubes, some other mechanism has to be looked for. One alternative to prevent accidental disengagement of the facebow at night is to alter the facebow design and make it self retentive. Several early designs were published in the Journal of Clinical Orthodontics.

This is the principle behind the Nitom² locking facebow™. It fits almost all fixed appliance upper molar tubes whether gingival or occlusal, double or triple. It fits both removable and functional appliances. It is fully adjustable, easy to use by both patients and Doctors and comes in a variety of sizes. It has been successfully tested with a suitable self releasing modular system on more than 697 patients in a large two year study. Removal of the facebow was reported by 8 patients on one night and only 2 patients on two nights out of a total of 166,550 nights. This significant reduction in the detachment rate has improved the safety of the facebow and increased the numbers of hours of wear achieved by the patients thus improving the treatment outcome. (AJODO 2000)

This alteration to the facebow design incorporated into the Nitom Locking facebow also complies with the recommendation made by the American Association of Orthodontists in 1975 that "all practitioners should take precautionary steps in their practice to eliminate accidental disengagement of the facebow from the buccal tubes and thus prevent any possible soft tissue damage"

The ability of patients and Doctors to successfully use this altered design and the improvement in retaining the facebow within the buccal tubes suggests that all patients treated with headgear (extra oral traction) should be fitted with self releasing headcaps and neckstraps with a short travel and a self retentive facebow like the Nitom² Locking facebow™.

The Nitom² Locking facebow™ is available in a variety of inner bow sizes and two lengths of outer bow size. It has a printed set of instructions, which include pictures, for both patients and Orthodontists. It has been tested in a two year study on 697 patients by 12 orthodontists. It has over 10 years of clinical experience. It is FDA approved with a 510K number and CE marked. It is laser welded and manufactured exclusively by Ortho-Care (UK) Ltd, 5 Oxford Place, Bradford, West Yorkshire, England, BD3 0EF.

Clinical Tips

Extra-oral traction should only be prescribed to those patients who are likely to comply with the orthodontists instructions. Patients should be advised to not wear it while playing or messing about. For most cases quiet evenings and in bed at night may be adequate.

The use of the equipment should be clearly demonstrated to the patient and/or parent, consent obtained, and an entry made in the case notes. For some of the younger, less dexterous, or poorly sighted patients, their parents can also be carefully instructed on how to fit the appliance, so they can supervise the fitting and removal of the appliance at home in the early phase of wear.

Written instructions should be issued to all patients and parents to take away with them. The Nitom² Locking facebow™ has printed instructions with pictures for both the patients and the Orthodontist.

A warning should be given that failure to comply with the instructions may result in injury.

The equipment should be carefully checked at each review appointment and an entry made in the case notes. The patient should be asked if they have had any problems with the appliance since they last attended.

If the patient removes the extra-oral traction and facebow in their sleep leaving the facebow in the bed, and cannot remember doing it on more than two occasions, careful consideration should be given to discontinuing the extra-oral traction.

Before fitting the facebow on the patient demonstrate and describe its function on a model of an upper arch with molar bands. Then encourage the patient to place and remove the facebow on the model. This helps the patient see how the facebow fits into the tubes and gives them a feel for the strength of the clips.

Before fitting the facebow on the patient check the fit of the ends of the inner bow into the extra oral traction tubes. If the fit is even slightly tight smooth the ends of the inner bow until

they fit easily into the tubes. Remember with the locking capability of Nitom² you don't require any friction between the ends of the inner bow and the tube housing.

When fitting the correct size of facebow on the patient place both ends of the inner bow in the mouth with the catches unlocked. Insert the first end into the buccal tube. Some operators then like to engage the first catch at this stage as they feel this tends to stabilize the facebow.

Apply no expansion to the inner bow at the first fitting, as it makes it much easier for the patient to insert the second side into the buccal tube. Any expansion of the inner bow can be introduced once the patient has got used to fitting the facebow.

Some practitioners prefer to teach the patients to remove the facebow, rather than fit the facebow as the first task. They feel their patients learn to use the facebow quicker.

Some practitioners prefer to demonstrate and fit only the Nitom² locking facebowTM at the first visit and withhold the extra-oral traction. The patient can then practice fitting and removing the locking facebow at home with their parent's help if required. On the subsequent visit to the orthodontist, the patient can demonstrate fitting the facebow to the Orthodontist before they are fitted with the headcap or neckstrap.

A few patients like to play with the catches. Advise them against doing this because eventually the wire will harden and break.

During space closing sliding mechanics in the upper arch, when the archwire tends to appear behind the upper first molars, the facebow can be turned over (180 degrees), so that the ends of the catches don't get trapped on or under the archwire ends. This can make it difficult for the patient to disengage the catch.

If facebows are used with removable appliances, construct them as an integral part of the appliance. If, for a good clinical reason, they need to be a separate unit, then use a locking facebow with the appliance. Always ensure extra retention is built into any removable appliance used with extra-oral traction.

Summary

The patients instructions are designed to reduce the risks of injuries as a result of horseplay or incorrect fitting.

The Nitom² locking facebowTM is designed to counter the mild/ moderate forces of accidental disengagement of the facebow at night, and will provide moderate resistance to intentional disengagement. It should also improve the hours of wear achieved by patients.

The self-releasing headcap or neckstrap should prevent the recoil traction if a large anterior displacing force from another child (bully or aggressive violence) overrides the locks on the facebow. These pro-active suggestions should help to improve patient safety, while increasing

the hours of wear and supporting the continued use of a very useful piece of orthodontic equipment.

For those who would like to read further into the subject please find below a list of references that may be of help:

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