SCIENTIFIC SECTION

Commentaries on scientific papers published in this edition

Ex vivo laboratory study to determine the static frictional resistance of a variable ligation orthodontic bracket system

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This laboratory-based study has produced a succinct paper which attempts to evaluate the old nemesis of all orthodontists, namely, friction. It looks at a relatively new bracket system (Delta Force) which allows a variety of arch ligation methods to be employed. As clinicians, we are all aware that the 'figure-of-eight' method of elastomeric ligation tends to produce the most binding and friction.[1] This clinical fact is useful during 'finishing' procedures, e.g. torque expression and maintaining space closure. However, earlier on in treatment, during the initial levelling and aligning stage with the pre-adjusted edgewise appliance, we wish to keep friction to a minimum in order to encourage favourable tooth movement of displaced and rotated teeth. In this situation, stainless steel ligature ties have been shown to produce the least frictional resistance compared to routine placement of elastomeric ligatures.[2]

The authors acknowledge that the clinical relevance of their findings may be 'diluted' by the fact that their friction testing and its influence on space closure was carried out using round 0.018-inch wire rather than the normal clinical situation of using final working archwires of rectangular dimension.

Despite this, the initial findings of this study should lead the authors naturally into an *in vitro* randomized clinical trial in order to examine the influence of the Delta Force bracket system with respect to patient comfort, space closing efficiency and overall treatment time. However, it is widely acknowledged that the results of laboratory studies are not often able to be replicated in the clinical situation due to a plethora of uncontrollable variables. One possible consequence of the minimum ligation of Delta Force brackets may be a clinical reduction in the rotational control of individual teeth. This can be a problem with some of the self-ligating bracket systems currently available on the market.

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References

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Orthodontic tooth movement in cholestatic and cirrhotic rats

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So why is this paper of any relevance to practising orthodontists? Are we about to start treating patients with serious alcohol induced cirrhotic liver function? Probably not but there is an increasing shift towards treating adult orthodontic patients some of whom will have poorly functioning livers, whether we know it or not, and others who may have some form of osteoporosis. In fact over a third of all adults over 60 years of age will have features of osteoporosis which may impact on orthodontic tooth movement. This paper then gives some insight as to what the consequences of these clinical scenarios might be with regard to orthodontic treatment. Cholestasis is impaired bile secretion and results in several systemic complications such as metabolic bone disorders. Bone loss and reduced osteoblastic function have been reported in patients with cholestatic liver disease and reduced bone mass is a common finding in patients with cirrhosis, especially in those with cholestatic liver disease. This may include osteomalacia

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(normal bone quantity, but poorly mineralized) as well as various forms of osteoporosis (reduced bone quantity and quality) such as decreased bone formation (which is also called low bone turnover osteoporosis) and increased formation/resorption rates (high bone turnover oteoporosis).

So what did they do? The authors used a rat model with tooth movement induced by a coil spring between the first molar and the incisor. They ligated the bile ducts to induce choleostasis and cirrhosis. They built the correct controls with sham operations. The cirrhotic group showed significantly increased orthodontic tooth movement. The mean tooth movement in the cholestatic group was significantly higher than in the other groups. They also looked at bone density and found this to be significantly decreased in the cirrhotic and cholestatic groups. This appeared to be independent of significant alteration in bone resorption or osteoclast function. The latter is unlikely and the measures were too crude for this to be convincing.

Teeth may therefore move faster in patients with osteoporotic conditions, some of which may be induced by cirrhotic or choleostatic conditions of the liver. You may wish to add these questions to your routine medical history questions for adults.

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