# What's new for the clinician?

## Summaries of and excerpts from recently published papers

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## 1. Utilising drill stops on twist drills to promote safety and efficiency when creating osteotomies for dental implants.

**Reference**

1. G Greenstein G, Greenstein B and Desai RN. Using drill stops on twist drills to promote safety and efficiency when creating osteotomies for dental implants. Journal of the American Dental Association, 2014 ; 145 (4): 371-5.

The placement of implants requires accuracy and precision and inadvertent mishaps can occur. It is estimated that in the United States of America, there will be some four million implants being placed annually by 2020. Some will be accompanied by problems of placement. Clinicians should ensure that implant procedures are performed in a safe manner. Of real importance is the need to establish the planned position of the implants and to ascertain optimum conditions, including the depth to which an osteotomy should be prepared. Clinical assessments and radiographs, including, where necessary, CT scans, are essential elements in planning. Once the desired depth has been determined, the use of stops on the twist drills facilitate precision in osteotomy preparation.

There are a variety of such stops on the market, most specific for the drills produced by the manufacturer although universal stops are available which can fit several designs. The stops are frequently colour coded for ready identification.

The dangers of drilling too deeply may be considered in different parts of the mouth. The mandibular canal is probably the most pertinent example and damage to the nerve can result in paraesthesia. The canal has been estimated to be 3.5 to 5.4 millimeters subjacent to the apices of the roots of the first and second molars but can in fact be much closer. Hence the need to establish this relationship before drilling. It is prudent to leave two mms of safety room between the canal and the apical termination of the osteotomy.

The mental nerve foramen is often located between the roots of the first and second mandibular premolars but can vary horizontally and may be coronal to the root apices in some 30% of cases. The anterior loop of the mental nerve courses below the foramen and then loops back and superiorly to enter the canal. Placing implants in this region should be done with extreme caution and the use of a CT scan is recommended. Stops on the twist drills are an important safety measure.

The submandibular fossa may be entered if the drill penetrates through the overlying shelf of bone and of course the same danger obtains when preparing osteotomy sites in the maxilla, where the sinus is at risk. In the latter case, healing does occur in most cases although excessive bleeding may be seen after penetration. A shorter implant should then be placed.

The incisive canal extends beyond the mental foramen and inadvertent penetration does not seem to affect the nerve vitality, for paresthesia is not seen. Bleeding can be controlled by inserting a guide pin into the hole and ultimately placement of the implant will stop the haemorrhage.

Subnasally, any drilling should be stopped before it reaches the cortical bone under the nose. As this layer is harder and thicker it is usually detected by increased resistance during drilling.

There may be varied reasons why overdrilling does occur, even when precautions are taken. The intraoral radiograph may be overangled creating an error in measurement. The attachment of a small ball bearing to the film offers a ready method of calculating any magnification factor. CT scans have a smaller measurement error.

Failure to use a secure finger rest can result in too deep a penetration should the patient move suddenly. The clinician may also use the hand other than the one holding the drill to provide additional stability.

The marks on the drill may be obscured by blood and saliva or by the adjacent teeth. The chair-side assistant can contribute by holding a mirror to protect the tongue and by using the suction tube effectively.

In the long run the most predictable method must be the use of drill stops. Note that the tip of the drill may extend the length of the drill by 0.4mm to 1 mm or even more. If the ridge is uneven where the drilling is planned, it may be advantageous to flatten the ridge so that the stop will rest on a level surface. Examination of the proposed site should offer the clinician guides as to how to ensure accuracy. If soft tissue intervenes, the thickness must be taken into account in determining the height of the stop.

### CLINICAL IMPLICATIONS

The use of stops offer several advantages….. Efficiency and Precision, Visibility, Reduction of stress for both operator and patient.

# 2. Retention of zirconium oxide copings using different types of luting agents.

**Reference**

1. Aleisa K, Alwazzan K, Nawaf Al Dwairi Z, Almoharib H, Alshabib A, Aleid A, Lynch E. Retention of zirconium oxide copings using different types of luting agents. Journal of Dental Science . 2013; 8: 392 –8.

Despite the numerous advantages attending the use of Zirconium Oxide (ZRO2) the question of the efficacy of adherence to a variety of substrates remains one of the inherent problems affecting the application of the material. In the endeavour to enhance adherence, various methods have been suggested such as surface grinding, particle air-abrasion or roughening the surface with a diamond bur.

Varying and contradictory results have emerged from studies conducted on different cements and different ceramic pre-treatments. The current study carries that investigation further by evaluating the ability of three commonly used luting agents to retain a coping under controlled laboratory conditions.

Extracted first premolars were cleaned and then mounted in acrylic blocks using a dental surveyor to ensure that there would be an axially directed force when the coping was subjected to a withdrawing force. The root of each tooth was further stabilised by a wire run through close to the apex.

Each tooth was prepared in a meticulously controlled manner in a milling machine set up to ensure the same preparation angles when the crown preparation was effected. New burs were used for each preparation. The resulting preparation had an axial length of 3 mm with a modified chamfer finish line. The specimens were measured and based on the mesiodistal and bucco-lingual dimensions, were divided into two groups.

On each specimen an impression was taken using a polyvinylsiloxane material supported in a customised special tray. Models were poured in type IV gypsum stone. A die hardener was applied.

A $ZnO_2$ coping was manufactured for each tooth and the internal surface was abraded with aluminium oxide airborne particles. Copings were then thoroughly cleaned. The sample was then further divided into three cementation groups of 14 each, with seven being of the larger dimension preparation. The study evaluated the performance of three luting agents : a resin modified glass ionomer cement,RelyX Luting 2 (RL), a self adhesive and self polymerised resin cement, Relyx U200 (RU) , and a dual polymerised resin cement, Relyx ARC (RA). Copings were then cemented onto the prepared tooth samples following precisely a careful routine that ensured a standard technique for each type of luting agent. After cementation and polymerisation, the specimens were left undisturbed for fifteen minutes, then were subjected to thermocycling for 3000 cycles at bath temperatures of 5degress and 55 degrees, dwelling time being 15 seconds in each bath. Thereafter the teeth were stored in distilled water for 24 hours at a ph of 7 and at 37.7 degrees for 24 hours.

Each tooth was then sequentially placed in a universal testing machine (Instron model 8500 Dynamic Testing System) and the force required to dislodge the cemented crown was the objective of the project. A custom-made chain was used to ensure that there was an even distribution of forces, and the traction was applied along the path of insertion. The dislodging force was recorded in Newtons.

The mean bonding strengths were 440N, 416N and 360N for RL, RU and RA respectively. A one way ANOVA test was applied and no significant differences were shown between the retention strengths of the three luting agents. The predominant mode of failure was seen to be between cement and coping with remnants of cement found mainly on the coping.

It may be concluded that all three cements are perfectly capable of retaining the ZrO2. copings quite successfully.

Resin- modified glass ionomer cements are hybrids wherein water soluble polymers are added to glass ionomer cements, creating a product superior in performance to conventional glass ionomer cements. Resin luting agents, by contrast, form a polymer matrix to fill and seal the tooth –restoration gap. Adhesive monomers may react with the prepared zirconium surfaces which may enhance bonding.

Whilst a number of other studies have investigated bond strengths there has been a lack of clear data for standard procedures with cementation of ZrO2 crowns. This study endeavoured to set reproducible standards, recognising finger pressure, however, as a variable difficult to control. Further research is indicated to examine the effects of various surface treatments, long term storage, thermocycling and other luting cements. However, and within the limitations of this study, it can be concluded that retention of zirconium oxide coping to crown preparations was not influenced by the types of luting agents under evaluation.

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Provided the product is used with appropriate attention to manipulation, any of the three luting agents tested would provide a reasonable degree of confidence that the crown would be effectively retained. However, the resin modified glass ionomer cement, RelyX Luting 2 (RL) did record the highest level s of shear bond strength.