Top tips for improving crown preparations

By James Baker,[1] Ewen McColl[2] and Christopher Tredwin[3]

Introduction

Mastering crown preparations can be one of the most rewarding areas of dentistry but comes with a range of challenges requiring a broad skill set to overcome them. Although technical excellence and manual dexterity are essential skills, close consideration needs to be given to the biological system we are working with, and pulpal anatomy and preservation of residual tooth substance should never be far from the forefront of a clinician's thoughts. As with all areas of dentistry, prior preparation and planning prevents poor performance. This prior preparation will involve careful prognostication of teeth, consideration of occlusion, and close coordination with nursing colleagues and laboratory technicians to facilitate success. Whilst obtaining the ideal crown preparation can be time-consuming, the tips below should allow realistic improvements for clinicians whilst improving outcomes for patients (Fig. 1).

Fig. 1 Crown preparations on anterior teeth

Pre-operative considerations

- To crown or not – even the most conservative of clinicians needs to closely consider the biological risks when embarking on crowning a tooth. The necessary tooth removal and use of an air turbine rotating at 350,000 RPM means there is always a risk of devitalisation[1] and patients need to be aware of this risk during the consent process. As is always the case, consider a range of available options and opt for the most conservative. Do your most destructive option last, never first, which will delay further progress down the restorative cycle. There are many clinical scenarios where traditionally a crown might have been prescribed that could now be treated in a much more conservative manner. With a combination of bleaching, orthodontics, additive resin composite and sympathetic enameloplasty, crowns on anterior teeth now occupy a very small treatment niche. Posteriorly, where cuspal protection may be indicated, a partial coverage restoration whether direct or indirect is generally a more conservative approach
- Take photographs – under normal and polarised conditions, with shade tabs adjacent to the teeth before tooth preparation to give the technician a reference shade
- Consider the occlusion of the preparation – before putting bur to tooth, it is essential to decide if the final restoration will be a guiding contact during lateral movements of the mandible or not and to remove suitable amounts of tissue from the occlusal aspect of the preparation. If the tooth is to disclude, make sure there is space between the preparation and opposing tooth not only when the patient is in ICP [intercuspal position], but also when they make mandibular excursions. If the tooth is to provide a guiding contact then it may contact the opposing tooth in excursion even after being prepared. When recording the jaw relationship, ensure the recording material is only placed between the preparations and opposing teeth, not between intact occluding teeth as this will give an inaccurate recording.

Assess restorability

- Strip everything back – in the process of deciding if a crown is truly indicated, removal of all existing restorations is essential to eliminate the possibility of caries, diagnose structural cracks, ensure good retention of the core and therefore the crown, and to assess the remaining structural dentine for retention of the crown. Once stripped of all restorations, photographs and sectional impressions serve as a useful record of the remaining dentine if the tooth is not being prepared for the crown at the same visit. A pre-operative radiograph is essential to eliminate periodontal or endodontic pathology
- Start with the end in mind – it is rarely the case that the desired form of the final crown will be the same as the starting situation. When placing the structural core, it is useful to create the desired final form so that when the tooth is prepared for the crown, it is easy to visualise the correct amount of tooth reduction. If this is not possible or practical, then a putty reduction guide made on a lab-made diagnostic wax up can serve the same purpose. Make a second putty to be used to construct the provisional crown.

Optimising the preparation

- Use rubber dam – it will retract gingiva and other soft tissues, improving visibility and access. It will make the procedure more comfortable for the patient by containing the coolant spray and it will save you time by making the process more streamlined
- Wetter the better – use copious irrigation as it takes only a five-degree increase in temperature to cause pulpal necrosis[2,3]
- Protect the adjacent teeth – break the proximal contacts with a narrow flamed-shaped diamond bur and leave a slither of

[1]Practice Principal, James Baker Dental Practice, 55 Wimpole Street, London, W1G 8YL, UK; [2]Director of Clinical Dentistry, Peninsula Dental School (University of Plymouth), Derriford Dental Education Facility, Plymouth Science Park, Research Way, Plymouth, PL6 8BT, UK; [3]Professor of Restorative Dentistry/Head of School, Peninsula Dental School (University of Plymouth), John Bull Building, 16 Research Way, Plymouth Science Park, Plymouth, Devon, PL6 8BU, UK.

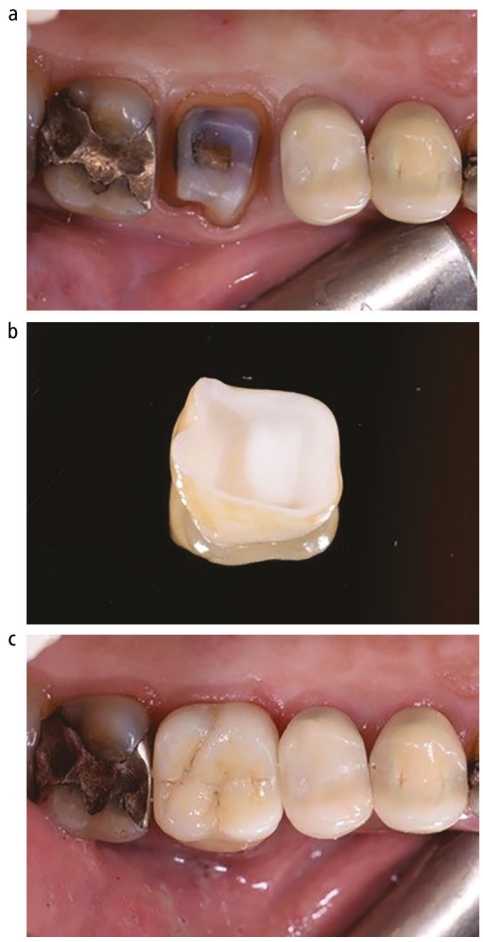

Fig. 2 a, b, c) Crown preparation of a heavily restored molar demonstrating precise handpiece control to define margins

tooth protecting the contact point to avoid inadvertently damaging the adjacent teeth with the bur. This works better than proximal strips which limit visibility and are easily perforated with a bur

- Hand piece control is key – use a two-handed finger rest to ensure complete control of the handpiece and bur. This will also prevent the inherent over-tapering created by the rotation of the wrist joint (Fig. 2)
- Use the right handpiece and burs – in the authors' experience, use of a 1:5 speed increasing handpiece rather than an air turbine improves preparations because the bur will run with less wobble and higher torque, thus giving more control of the preparation process. Select burs with round rather than flat ends to prevent creating sharp internal line angles that can produce stress concentrations, risking fracture of the abutment.

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Improve impression accuracy

- Double cord – place one narrow retraction cord before refining the margin preparation followed by a second larger cord five minutes before taking the working impression. Record the bite whilst you're waiting to save time. Wet the area before removing the larger cord then wash thoroughly and dry. Scrutinise the margins and tuck in the smaller cord if it has been dislodged anywhere. Apply a haemostatic agent if there is any bleeding, no matter how minor, as this will spoil the impression
- Use rigid trays – to prevent flexure and distortion of the impression. Ensure the tray is completely free of the teeth or bony anatomy. Apply suitable tray adhesive and allow time for it to become tacky. Use a heavy body in the tray and light body wash on the teeth. Apply the light body just before inserting the tray as it will set faster in the mouth than the material in the tray. Insert the tray with a rolling action and a slight jiggle to prevent air entrapment. Hold completely still with both hands for the entire setting time
- Use a face bow – when providing crowns for teeth that will guide mandibular movement, when providing multiple crowns in the aesthetic zone to prevent introducing a cant, and when restoring the last tooth in the arch to prevent the tipping of hand-held models.

Optimising temporaries

- Make good temporaries – well-made temporary crowns can provide lots of valuable information about occlusal function, aesthetics and phonetics that can be transferred to the lab. When making temporaries, apply a thin layer of Vaseline to prevent bonding to any freshly placed composite cores. Re-marginate using flowable composite to ensure excellent marginal closure. When trimming the excess from margins always orientate the cutting instrument to the long axis of the crown to prevent damaging the margin. After checking and adjusting the occlusion, clean off the oxygen-inhibited layer with an alcohol wipe and apply and cure a layer of glaze coat to the surface to provide a smooth surface that is comfortable and resists stain. Before cementing, sandblast the fit surface, this ensures a neater clean-up later when removing the crown as the temporary cement preferentially adheres to the temporary crown rather than the tooth. Always use non-eugenol temporary cement since eugenol may mask pulpitic symptoms that simply return when the definitive crown is cemented.

Crown fit

- In the authors' experience using local anaesthetic when fitting crowns improves success – it's tempting not to, especially when the crown is on a non-vital tooth, but the surrounding tissue is still very much alive and sensitive and not anaesthetising these will inhibit proper removal of cement residue
- Removing the temporary crown – try to avoid levering a metal instrument between the preparation margin and the temporary crown as this can damage the tooth and affect the fit of the final crown. Instead invest in some crown removing forceps. Once removed, clean the preparation thoroughly with a slurry of water and pumice in a prophy cup. You can also use a mild acid used as a pre-GIC conditioner to ensure a very clean preparation
- Have a system for crown fitting – the order in which you check various aspects of the final crown is important. First, is the shade correct? You can check this before even removing the temporary crown. If it's wildly out this may require a remake so waste no more time. Next, will it seat? Check and adjust the proximal

contacts first, then if it still doesn't fit, examine the margins for any obvious over-extension. Finally, look at the fit surface and any damage to the die. Once the crown is fully seated with firm but flossable contact points, check there are light holding contacts in ICP using a suitable marking medium – not a thick paper or ribbon but a thin mylar based product. Last, check contacts in mandibular excursions. Again, you need to know in advance if you want contact on the crowns in excursion or not and adjust the crown accordingly

- Following the IFUs – instructions for use from the manufacturers of crown luting cements and resins are there for a reason. Ignore them at your peril!

Post-operative care and maintenance are key

- Take a post-op radiograph – to check for cement residue and to act as a base line to compare the marginal appearance at subsequent review appointment[4]
- Look after the new crown – provide the patient with detailed oral hygiene instructions on how to maintain their new crown and impress on them the importance of regular follow up to pick up any complications at an early stage. If the patient is prone to clenching or grinding then a rigid maxillary occlusal splint is a very sensible investment to protect your work and their teeth.

Conclusions

While crown preparations are less commonly carried out due to advances in adhesive techniques, they are an important skill set in the clinician's armamentarium. The above tips will hopefully assist hard pressed clinicians to plan and deliver well designed and constructed crowns in close conjunction with technician colleagues. As always, control of active disease prior to commencing treatment, meticulous planning, and informed consent are key elements in optimising outcomes for our patients. ■

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CONFERENCE REPORT

The British Orthodontic Society Conference 2022

By Nicka Kafil, Birmingham, UK

The British Orthodontic Society Conference 2022 was held at the NEC in Birmingham, and I was honoured to attend as the *BDJ Student* representative. It consisted of intriguing lectures from a diverse range of clinicians with an abundance of knowledge.

The conference commenced by Dr Farhad Naini describing orthodontists as the architects of dentistry in the lecture: 'Achieving Predictable Results in Orthognathic Surgery'. Dr Naini described the layman seeing the overall lack of beauty in a smile, while an orthodontist notices the minute details in undesirable aesthetics alongside the structural issues (like an architect looking at a building). The orthodontic field, like architecture, must consider a combination of function and aesthetics in their work.

In the 'Management of Adult Cleft Palate' lecture, Dr Preeti Jauhar explained the acronym SMART – smart, measurable outcome, attainable, achievable, and timely. This is to aid orthodontic treatment planning and a requirement due to the multidisciplinary approach required. This illustrated the expansive number of healthcare professionals involved and the vast number of different fields that are involved in the holistic approach of patient care.

I am certain I will apply this valuable guidance to all my future learning and clinical experience.

Lars Christensen presented a unique perspective about 'Digital Technologies Coming to the Rescue of Orthodontics'. The use of three-dimensional virtual surgical planning (3D-VSP) is utilised to aid planning of orthognathic surgery. This gives the patient a realistic expectation of what the final product of their smile will look like before commencement of life-changing surgery. This will help patient expectations to be realistic as they are influenced by social media which leads to body dysmorphia. Unfortunately, this is prevalent and can be difficult to overcome for orthodontists, therefore digital technology is helpful to increase patient satisfaction with orthodontic outcomes.

In the press conference, Dr Michael Moseley described 'your smile as your personality'. Also, that psychological studies have shown that a smile intensity in photographs predicts the likelihood of

divorce later in life! This is an example of the effects of orthodontics not only on your teeth but mental and physical wellbeing. Like Dr Christensen, this highlights that orthodontic treatment has multiple positive outcomes on the patient, ranging from physical function to psychological benefits.

The enthusiasm and dedication to the speciality from the speakers and organisers was reflected in the success of the conference. The learning and networking opportunities are valuable for clinicians at any stage in their career.