

Temporary restorations: the key to success

Basil Mizrahi¹

Key points

Describes the benefits of good temporaries and the disadvantages of poor temporaries.

Highlights different techniques and protocols for making temporary crowns.

Demonstrates how good temporary crowns can help to improve the quality of treatment.

Describes the benefits and qualities of acrylic resin for making temporary crowns.

Abstract

For newly graduated dentists, temporary restorations are often not seen as an important part of treatment, but rather a simple stopgap from the time the final impression is taken until the final restorations are fitted. This is due to the fact that the teaching is focused on single-tooth dentistry, where the requirements from the temporary are limited and relatively simplistic. However, as the dentist progresses along their career path and starts treating more complex cases, the need for, and importance of, high-quality temporary crowns becomes essential. They allow the dentist to maintain stability during treatment of more complex cases and provide the time needed to carry out individual procedures and multiple stages. This alleviates the pressures associated with these cases and allows treatment to be carried out in small stages. If treatment of a complex case is undertaken without the ability to provide high-quality temporaries, treatment may spiral out of control, become highly stressful and ultimately lead to premature failure of the final restorations. It is the aim of this article to discuss the importance of temporary restorations and highlight the concepts, techniques and materials required.

Introduction

The current trend towards minimally invasive dentistry (MID) means less dependence on traditional crown and bridge temporary restorations. Unfortunately, there are still a large number of patients who present with mutilated and/or heavily-restored dentitions that are beyond the realms of adhesive dentistry. Management of these cases relies heavily on temporary restorations and the more complex the case, the more important the temporaries become. If a dentist wants to advance from the realm of single-tooth and piecemeal dentistry to the treatment of more complex and comprehensive cases, they need to become proficient in their ability to fabricate high-quality temporary restorations.¹

Best friend or worst enemy?

Temporary restorations can either be the dentist's best friend or worst enemy. High-quality temporary restorations are aesthetically

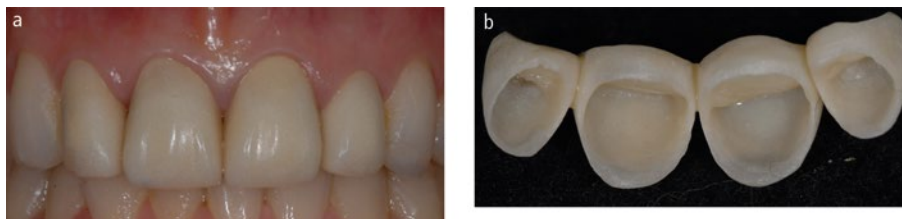


Fig. 1 Aesthetically pleasing, well-fitting, comfortable and stable temporary crowns

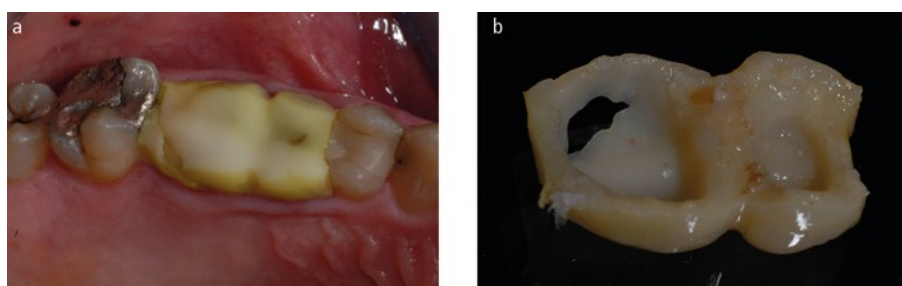


Fig. 2 Poorly fabricated temporary crowns

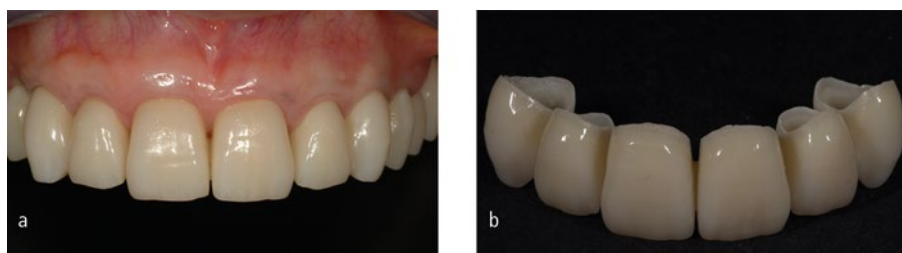


Fig. 3 Laboratory-made provisional crowns allowing pre-visualisation of the proposed final crowns

¹Basil Mizrahi Prosthodontics, 20 Harley Street, London, UK.
Correspondence to: Basil Mizrahi
Email: info@basilmizrahi.co.uk

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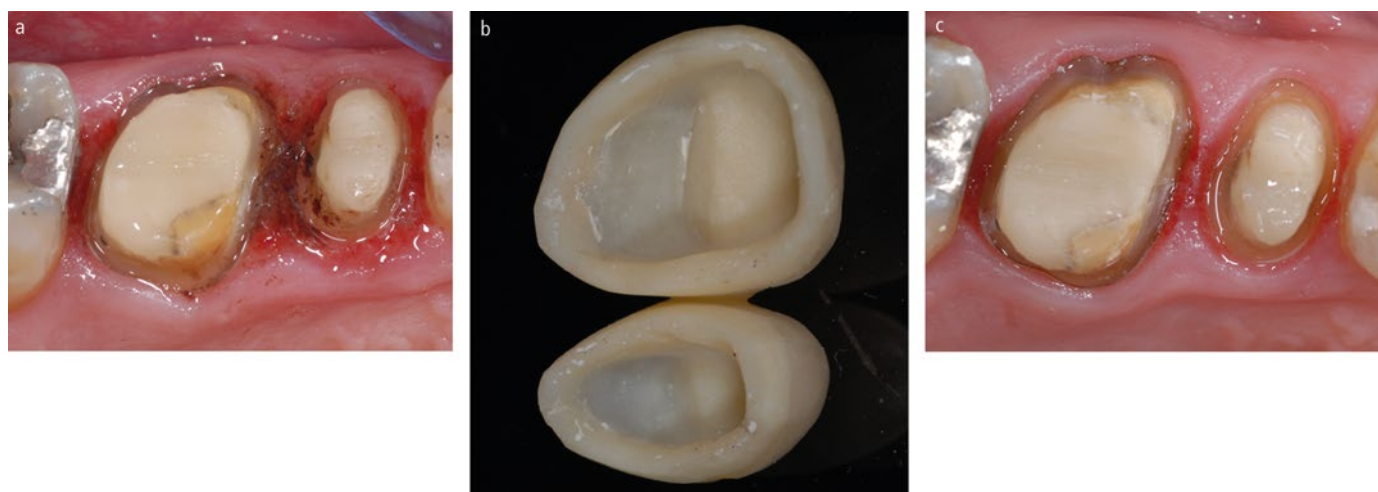


Fig. 4 Optimal tissue health created by temporary crowns

pleasing, well-fitting, comfortable and stable. They become the key to success, whereas poor temporaries can add stress and unpredictability to treatment (Figs 1 and 2).

High-quality temporaries provide the following (Figs 3, 4, 5, 6):

1. They give the dentist the ability to devote the required amount of time to each clinical procedure. Without adequate time, individual procedures may become too rushed or stages of treatment too condensed, leading to a compromise in quality
2. They allow visualisation of the anticipated desired aesthetic outcome. This allows the dentist and patient to have input into aspects they are unhappy with, thereby guiding the dental technician and avoiding aesthetic surprises in the final result
3. Temporary restorations with well-fitting margins create the optimal tissue health and support needed for high-quality impressions. Without this, impressions tend to be unpredictable and compromised in quality which then jeopardises the final fit of the restorations
4. They allow informed decision-making. It is only at the time of removal of the existing restorations that the dentist has a full perspective on the condition of the underlying tooth. The dentist then has time between appointments to consider possible options. Some of these decisions may rest predominantly with the dentist; for example, what type of crown or post to use, or whether to replace a core restoration. Other decisions will need careful consideration by the patient without the pressure of time, such as whether to save or extract a tooth
5. They also create adequate time for the technician to fabricate the final crowns. Skilled technicians who take pride in their work and work to a high standard require time to achieve these results, which in turn means the temporary restorations may need to remain in the mouth for an extended period of time
6. Aesthetic temporaries elevate the patient's and dentist's expectations and encourage the technician to achieve an aesthetic result superior to that of the temporaries
7. High quality temporary crowns also remove any pressure or temptation to cement sub-optimal final crowns. The dentist and patient will not feel compelled to fit the final crowns because of the reluctance to go back into unsatisfactory temporaries. In this way, the dentist will embark on a journey of constantly improving their aesthetic results by not accepting sub-optimal final crowns.

Poorly fabricated temporaries may elicit inter-appointment tooth sensitivity, unwanted emergency appointments due to de-cementation or breakage and increased urgency/pressure to fit final crowns. It is sometimes said that temporaries should not be made too 'good' for fear that the final crowns will not look as good. This approach uses unaesthetic temporaries to lower the patient's expectations in preparation for the final crowns. The danger with this approach is that although the patient may be satisfied with the final crowns on the day of cementation, because the reference will be unaesthetic temporaries, within a few weeks, once the unaesthetic temporaries have been forgotten, the new reference becomes a 'nice smile' and the patient then has 'delayed onset dissatisfaction' with the new crowns. Good



Fig. 5 Defective crown and preoperative radiograph



Fig. 6 Crown removed allowing for full assessment of underlying situation and then placement of a stable and aesthetically pleasing temporary crown

temporaries allow the dentist to be in control of the case; bad temporaries allow the case to control the dentist.

Clinical techniques

Temporaries can be classified into immediate chairside temporaries or laboratory-fabricated provisionals.

Immediate chairside temporaries

Immediate chairside temporaries are fitted on the day the existing restorations are removed and the teeth are prepared. There are three techniques that can be used: the matrix or copy technique; the shell or direct/indirect technique; and the indirect technique.

Matrix or copy technique

A matrix made from either an alginate impression, silicone putty or plastic suckdown material, is loaded with the temporary material and placed over the prepared tooth. The matrix can be made directly in the mouth or indirectly on a study model. The temporary crown is then trimmed, polished and cemented onto the tooth. This technique is useful for one to two teeth (Figs 7, 8, 9).

Shell or direct/indirect technique

This technique is used when multiple teeth (three or more) are involved as well as in highly aesthetically demanding cases. It is a hybrid technique, combining a laboratory-made shell with a direct intraoral relining on the prepared teeth. The dental technician uses study models to construct a durable and aesthetic 'hollowed-out' shell from acrylic resin (Fig. 10). The technician should also fabricate a 'seating jig', to ensure that during relining procedure the shell is positioned in the mouth in the same position it was fabricated on the model.² In the surgery, the dentist removes the existing restorations (Fig. 11) and, before relining the

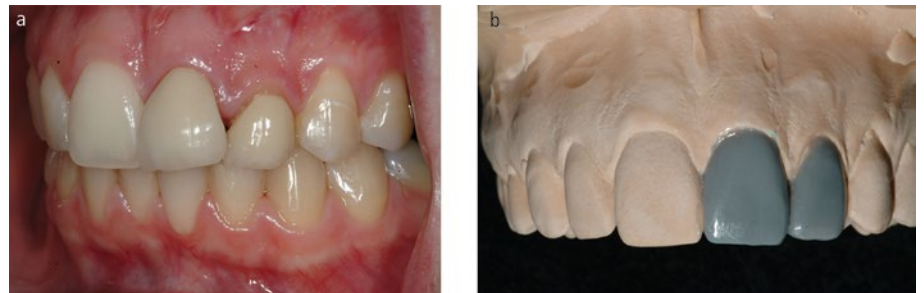


Fig. 7 Preoperative situation with defective crowns on teeth 21, 22 with wax-up on preoperative model

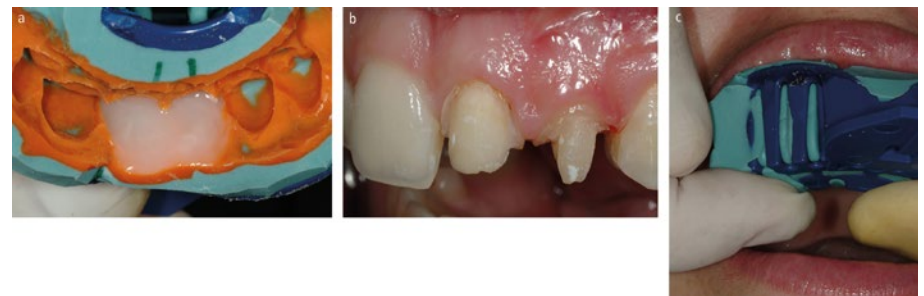


Fig. 8 Temporary material in impression material matrix applied over prepared teeth

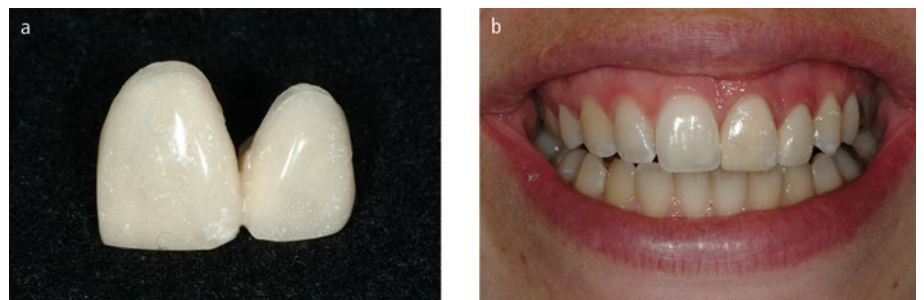


Fig. 9 Final temporary crowns

shell, carries out a fit checking procedure to ensure the shell seats over the preparations in the mouth in the same way it seated on the model. For this, light-bodied polyvinylsiloxane impression material is used to locate any binding areas. These areas are then relieved on the shell or on the teeth (Fig. 12). Failure to do

this will lead to incomplete and/or malaligned seating of the shell during the relining procedure and subsequent excessive adjustment of the relined temporaries, negating the aesthetic result created by the dental technician. Once complete, and aligned seating of the shell has been ensured, the shell is relined with acrylic



Fig. 10 Hollowed out shell temporaries and seating jig made on study model



Fig. 11 Removal of existing crowns

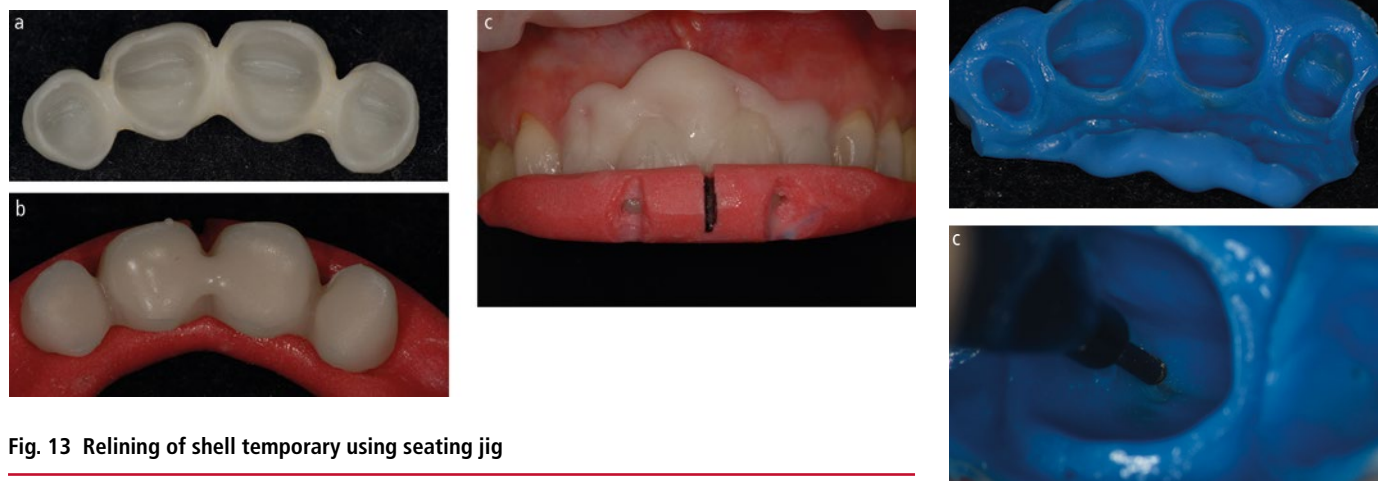


Fig. 13 Relining of shell temporary using seating jig

resin on the prepared teeth (Fig. 13). Care is taken to ensure the acrylic is kept cool, while polymerising and the shell is lifted up and down on the teeth during polymerisation to ensure it does not lock onto the teeth. The acrylic resin is allowed to polymerise fully and then trimmed, polished and cemented onto the preparations (Figs 14 and 15). Acrylic resin, rather than bis-acryl, should be used to reline the shell as it is less rigid and goes through a longer 'doughy' stage to allow sliding up and down on the teeth during polymerisation.

In both the aforementioned techniques, it is important to control the exothermic reaction of the provisional material as it sets intraorally. This is especially important when using acrylic resins which tend to generate more heat than bis-acryls.³ As the material

is polymerising, the matrix or the shell temp should be water-cooled. It is also important to accommodate the shrinkage of the material as it sets. If the material is allowed to fully polymerise on the teeth, it may lock on to the teeth. If the material is allowed to polymerise off the teeth, it will not be possible to replace the temporary back onto the teeth. This again is especially important when using acrylic resins which tend to undergo more shrinkage than bis-acryls.⁴ The correct technique is to gently slide the temporary up and down the teeth as the material polymerises.

Indirect technique

As opposed to the shell technique, in which the shell is made before the teeth are prepared, in the indirect technique the temporaries are made on

Fig. 12 Fit checking of shell temporary using light body impression material

a model of the prepared teeth. It is also designed to be used for multiple teeth (three or more) and eliminates the need for intraoral relining and the associated problem of exotherm and shrinkage. It also allows the patient to relax while the temporaries are being made extra-orally. An impression of the prepared teeth is taken and poured up immediately with quickset stone. A matrix, made either directly on the teeth before preparation or on a model wax-up, is then used to fabricate the temporaries outside the mouth. The temporaries are trimmed and cemented onto the teeth. This technique does, however, require that the dentist has the facility and



Fig. 14 Shell temporary with excess acrylic resin



Fig. 15 Trimmed and fitted temporary crowns



Fig. 16 Impression taken of prepared teeth

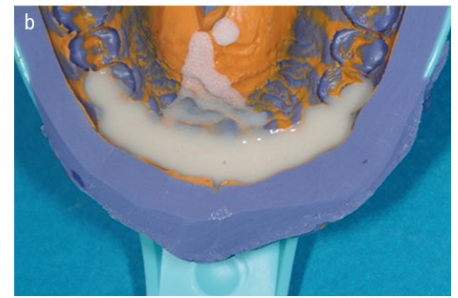


Fig. 17 Acrylic resin temporaries made on model of prepared teeth



Fig. 18 Finished temporaries



ability to pour up an impression and fabricate a stone model (Figs 16, 17, 18). A technique using a flexible model making material instead of stone has also been described by Boberick *et al.*⁵

Trimming and polishing

All of the above techniques require trimming of excess material and adjustments to ensure well-fitting margins and aesthetically pleasing shapes. A good knowledge of tooth morphology is, therefore, important. The temporaries should be polished to a smooth shiny surface in order to resist plaque accumulation and staining, and promote good soft tissue health.⁶ Trimming and polishing is carried out extra-orally using a straight handpiece and a series of burs, silicone wheels and a diamond disc (Fig. 19). High power magnification is needed to ensure accurate trimming to the margins. Final polish is provided using pumice and polishing paste.

Splinting of adjacent temporaries

Adjacent temporary crowns should be joined together where possible for the following reasons:

1. Stability and retention: splinting adjacent temporaries enhances retention. Temporaries are usually cemented with relatively weak temporary cements and single units may become loose after a period of time
2. Convenience: for easy removal and recementation
3. Immobilisation: between the time the impression is taken and the time the crowns return from the dental laboratory, there should be no movement of the teeth. Unification of adjacent temporaries helps to prevent this.

When adjacent temporaries are joined, sufficient space needs to be created at

the gingival embrasures to allow healthy conditioning of the tissues. If the papillae are impinged upon, they will become inflamed and this will adversely affect future treatment stages. In addition, the incisal embrasures and interproximal aspects need to be carefully trimmed so the crowns appear as individual teeth. The optimal instrument for trimming embrasures and interproximal areas is an ultrathin diamond disc on a straight handpiece (Fig. 19). Trimming adequate embrasures and interproximal areas creates small contact areas.

If bis-acryl is used, these contact areas will tend to break during removal and replacement of the temporaries. The use of acrylic resin is suggested, as it is more flexible and less susceptible to breakage.

Tissue health and support: remargination

When preparation margins are subgingival, capturing an accurate impression becomes more difficult and tissue health needs to be pristine with no bleeding. The temporary crown becomes the key to establishing optimal tissue health and support. ‘You get out from the tissues what you put into the temporary’.

If the margins of the temporary are not precisely fitting and adapted to the underlying tooth preparation, gingival tissues will become inflamed and bleed during impression taking. To achieve a well-fitting margin on a temporary crown often requires a separate ‘remargination’ procedure (Fig. 20). This involves cutting back the margin of the temporary crown and reapplying the temporary material on the margin of the tooth, before re-seating the temporary crown. If the margin is not fully exposed and visible, retraction cord or electrosurgery may be needed. Rather than taking an impression of inflamed, bleeding tissue, the temporary crown with well-adapted margins should be cemented and left in place for four to six weeks. This will allow sufficient time for the tissue to become healthy and will allow for a good final impression (Figs 21 and 22). The advantages of using acrylic resin over flowable composite for remargination are discussed later in this article.

Tissue support is also an important function of the temporary crown. Without the correct tissue support, the tissues may collapse over the margins when taking the impression, even with the use of retraction cord. This support is obtained by creating the correct emergence profile on the temporary crown extra-orally with flowable composite and leaving it in place for four to six weeks before taking the impression (Fig. 23).

Materials

The material of choice for simple situations, where the temporary is primarily a stopgap between the impression appointment and the fitting of the crown, is bis-acryl. It is simple to use and aesthetically pleasing. However, in more complex situations, where there are higher demands on the temporary crowns, acrylic resin becomes the material of choice. Although it is

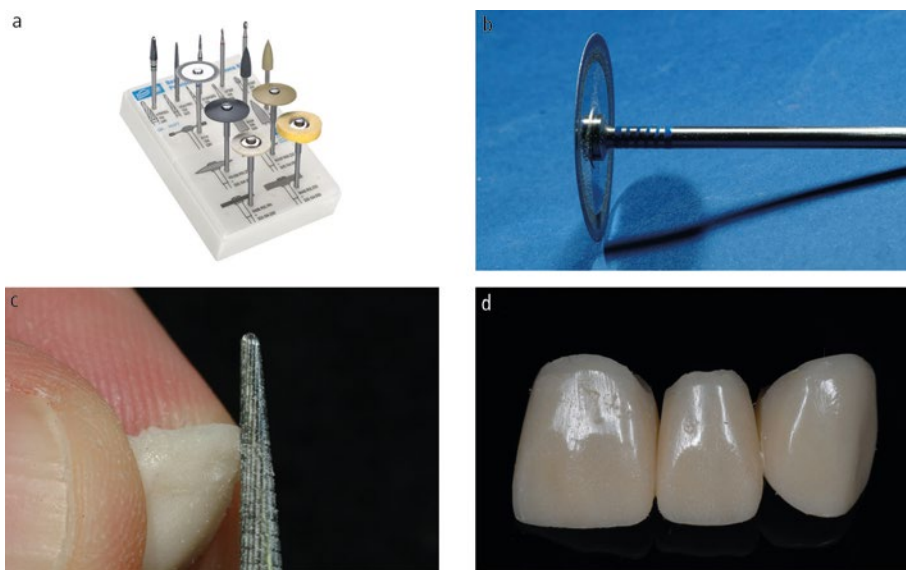


Fig. 19 Temporary trimming and polishing kit with ultrathin diamond disc for trimming interproximal areas on splinted temporaries

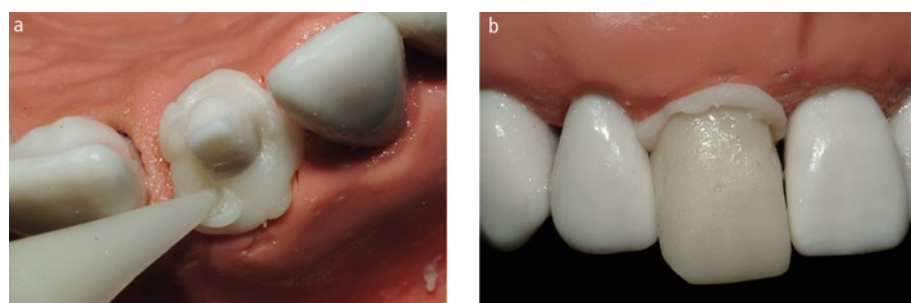


Fig. 20 Remargination of temporary crowns

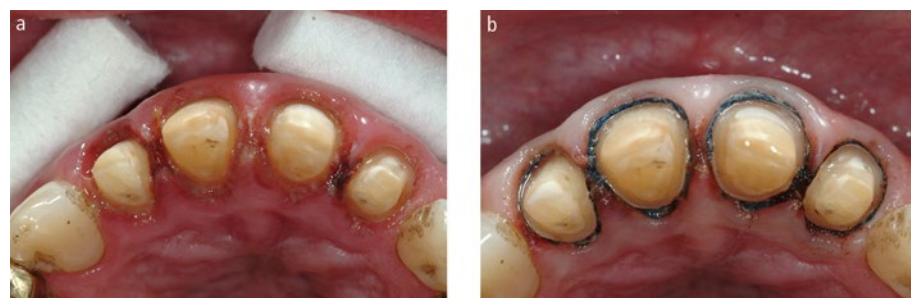


Fig. 21 Retraction cord placed to expose preparation margins before remargination

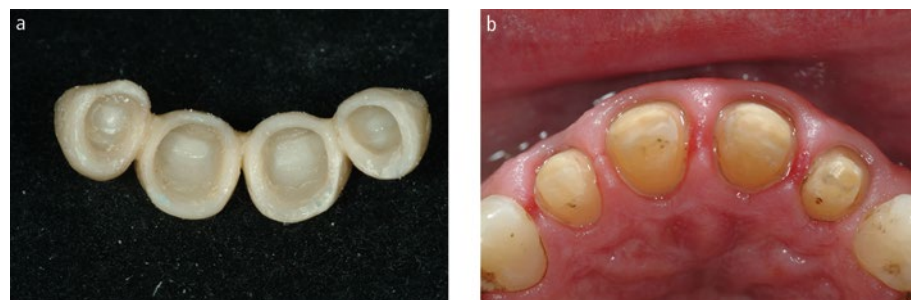


Fig. 22 Tissue health created by well-fitting temporary crowns

more difficult to use and has negative properties such as heat generation and shrinkage during polymerisation, there are several benefits. The advantages of acrylic resin over bis-acryl^{7,8,9,10} in more complex cases include:

1. It is not as brittle as bis-acryl and has a higher flexural strength.¹⁰ This helps avoid breakage during removal of the temporary, with artery forceps-type devices thereby allowing removal and replacement over multiple appointments as needed. In addition, it allows for the creation of wider embrasures with smaller contact points between adjacent splinted temporaries. This aids tissue health and aesthetic appearance
2. Bonding of new acrylic to old acrylic is strong and durable, which in turn is conducive to modification and refinement as treatment proceeds. For example, hollowing out and relining during post and core fabrication
3. It has an extended 'doughy' phase, which is necessary when simultaneously relining multiple teeth that may have divergent paths of insertion. By sliding the temporaries up and down during the doughy phase it prevents the temporaries locking onto the teeth. This is important when remarginating or relining multiple temporaries
4. It is more conducive to intra-crevicular remargination for the following reasons: it is auto-curing, thereby eliminating the problem of light curing in inaccessible areas; unlike composite or bis-acryl, it is not moisture sensitive, and therefore is not affected by small amounts of blood or crevicular fluid; in contrast to this light-cured flowable composite, acrylic resin autocures and has an extended doughy phase allowing for removal before full polymerisation thereby eliminating unwanted 'lock on'
5. It is more colour stable than bis-acryl resins.¹⁰

Composite resin can be added to acrylic resin temporaries to correct minor deficiencies or make aesthetic improvements. It is the author's experience that optimal bonding of composite to acrylic is obtained by roughening the surface of the acrylic and treating the surface with acrylic monomer rather than composite bonding agent. However, acrylic resin does not bond well to cured bis-acryl in small amounts. If an attempt is made to remarginate a bis-acryl temporary crown with acrylic resin, the entire temporary crown should be hollowed out and a full reline, rather than remargination, procedure carried out to enable a larger bonding surface (Fig. 24).

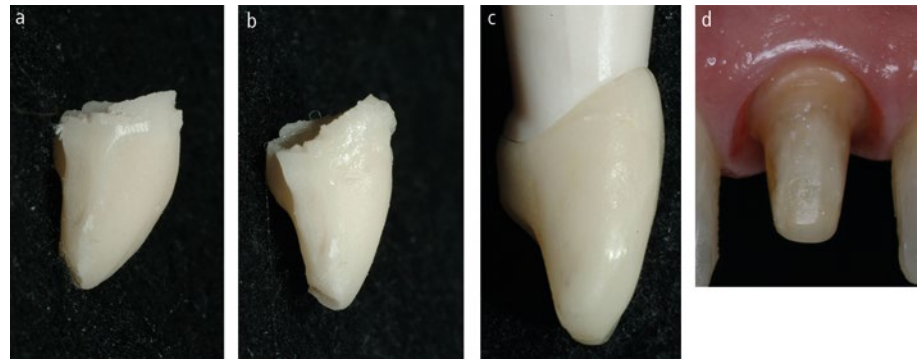


Fig. 23 Extraoral creation of emergence profile on temporary crown to create optimal soft tissue support



Fig. 24 Bis-acryl and acrylic resin temporary material

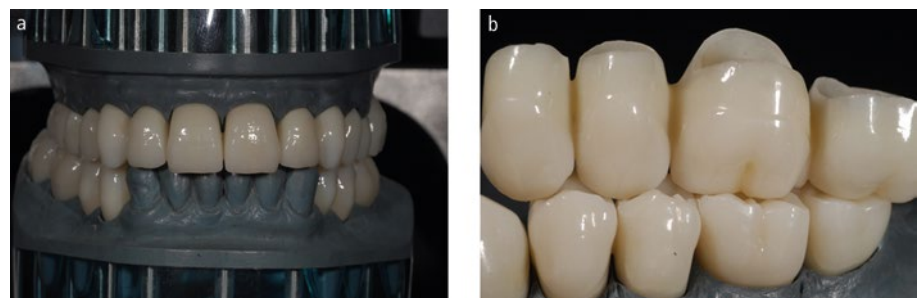


Fig. 25 Laboratory provisionals

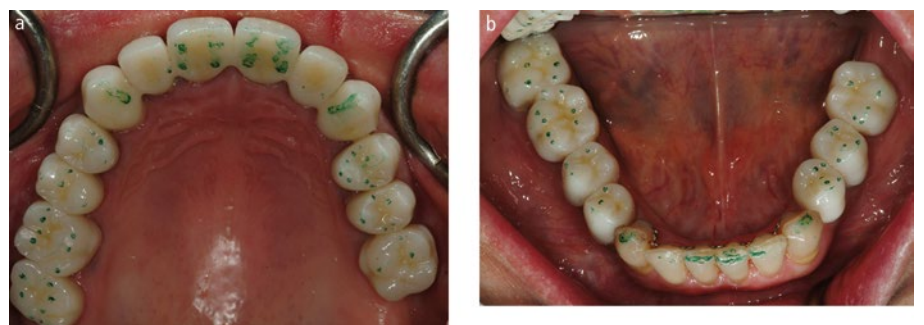


Fig. 26 Occlusal stability created and refined on laboratory provisionals

Laboratory provisionals

In some situations, once the teeth have been prepared and fitted with chairside temporaries, it may be necessary to have a further set of temporaries made in a dental laboratory from

impressions of the tooth preparations. These will be referred to in the remainder of this article as laboratory provisionals. Being made in a dental laboratory, they have the advantage of being stronger, more aesthetic and better

fitting than chairside temporaries and they should require no, or minimal, adjustment. In order to achieve the optimal benefits from laboratory provisionals, they should be made with the same attention to detail as the definitive crowns and serve as a functional and aesthetic blueprint for the final restorations (Figs 25 and 26).

Laboratory provisionals may be necessary in the following situations:

1. In aesthetically demanding cases to visualise as closely as possible the proposed final aesthetic result
2. Where long-term temporisation is required such as in implant healing
3. For the creation of optimum tissue health around multiple preparations before taking the definitive impression. It is difficult to carry out precise intraoral remargination around multiple teeth. It may be preferable to take an impression of the preparations and allow the technician to fabricate precisely adapted provisionals. These are then temporarily cemented and left for at least eight weeks to allow the inflamed tissue to heal and mature
4. To create and ensure occlusal stability in full arch cases before final bite registration. In a complex and comprehensive case there is often occlusal instability at the start. While working through the case, any occlusal instability should be eliminated by occlusal adjustment of the

chairside temporaries. When treatment proceeds over an extended period of time, the chairside temporaries may lose their occlusal detail, thus making occlusal stability and testing of the final occlusal position difficult to establish. In this scenario, an accurate bite registration at the desired vertical dimension can be taken. Provisional restorations with detailed and precise occlusal morphology can then be fabricated and allowed to remain in the mouth for one to two months, to ensure occlusal stability and function.

Conclusion

When treating more complex and comprehensive cases, temporary restorations become the key to success. They provide the stability needed to allow adequate time to be devoted to procedures and stages without the pressure of time constraint. They allow each stage of treatment to be completed and assessed before moving on to the next stage. They allow visualisation before finalisation in aesthetically demanding cases, and allow for the creation of optimum tissue health essential for taking high-quality impressions. High-quality final restorations will be preceded by high-quality temporary restorations. If a dentist has the ambition to start treating more complex cases, it is essential to become proficient in making and managing temporary restorations.

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