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# Application of Polytetrafluoroethylene (PTFE) Tape in Prosthodontics: An Overview

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**Abstract:** ***Prosthodontic procedure are ever developing, one reason for this can be attributed to newer material with better handling properties and our ability to manipulate them more effectively. As a result various techniques have been described to aid clinicians in obtaining predictable result in prosthodontic procedures. This article aims to review the use of plumber's tape to assist in prosthodontic and implant dental procedures.***

**Keywords:** PTFE Tape, Plumber Tape, Screw Access Filling Material

## 1. Introduction

Polytetraflouroethylene (PTFE) is a polymeric material that has common uses outside the dentistry. Its application include incorporation into cookware and components for computers. In dentistry it has been used for the purposes of guided tissue regeneration, the coating of instruments to improve handling properties .More recently the use of PTFE for purposes of screw access channel filling has been described. PTFE is relatively inert; as such it is capable of resistance to solvents and acids, therefore will not degrade when used with dental etchants. PTFE also has a low static and kinetic coefficient of friction ensuring a 'non-stick' application and removal without leaving behind a residue. Due to PTFE's 'high break elongation' it is capable of being stretched up to 400% of its original length without tearing. As such the material can be stretched and adapted closely to different surfaces and manipulated without the risk of being destroyed. Despite the material being available in thin sections (30–120 μm) it does not significantly lose its shear strength . In addition to excellent insulating properties, PTFE has a high melt viscosity which allows the tape to be sterilized for dental purposes in an autoclave. These qualities suggest a number of potential uses in prosthetic dentistry.[1]

**Eliminating sub-gingival cement stagnation**

Removal of excess cement is crucial during the placement of definitive implant or tooth borne restorations. This is essential in the presence of sub-gingival finish lines and the use of insoluble resin luting cements.[2] Failure to do so can result in a deposit-induced inflammatory response of the periodontal or peri-implant tissues from plaque and bacteria stagnation. It has also been shown around implant abutments for cement retained implant prostheses, where the peri-implant tissue's capacity to respond to plaque is reduced.[3] The retention of set radiolucent resin cements in the gingival sulcus can elicit a chronic soft tissue inflammation or mucositis, which in turn may result in the eventual progression to peri-implantitis, the irreversible loss of bone around dental implants.[4] Extra-oral cementation for implant prosthesis has been suggested, using a duplicate core and die spacer to act as the cement space; however this method is time consuming and requires the use of cement with a long working time.[5] The use of retraction cord has been discouraged around peri-implant tissues due to the risk of exceeding the peri-implant tissue capacity to resist the placement pressure, leading to damage to the biological seal around the implant.[6] The potential increase in gingival sulcular space caused by the compaction of cord may result in the down flow of cement apically and entrapment of the cord.[7] The cord itself consisting of multiple interwoven cotton strands can become impregnated with cement resulting in difficulty with removal from the sulcus. PTFE is comparatively impregnable without strands or filaments. PTFE tape can provide an atraumatic barrier to protect peri-implant tissues during cementation, with added advantage of ease of retrievability. PTFE tape is available in a thickness of 50 μm providing a thin barrier and preventing aggressive retraction of the gingival sulcus causing trauma to peri-implant tissues. By stretching PTFE tape around the implant abutment to form a protective 'bib' it is possible to create a physical barrier to prevent apical migration of cement.[7] The tape can then be teased out without causing damage to the peri-implant tissues .The application of PTFE as a barrier may also be extrapolated to tooth borne crowns to aid in the removal of any cement flash when cementing temporary of definitive crowns with subgingival margins, whereby the tape is placed circumferentially below the gingival margin. Care must be taken not to trap the PTFE tape into the fit surface of the restoration during cementation, which may impede full seating of the restoration.

**Protecting implant abutment screw heads during sealing of screw access channels**

Screw-retained implant restorations have the advantage of retrievability for maintenance procedures such as replacement of components and hygiene purposes when compared to cement retained restorations. The potential for bacterial infiltration via the screw access channel has been shown in-vitro.[8] A method of reducing this bacterial

penetration is to seal the screw access channel. However, it is important to keep in mind the sealing restoration does not to compromise access to the abutment screw for future deconstruction of the implant restoration. Therefore, placement of a well-adapted passive material deep in the screw access channel over the abutment screw head minimises the risk of screw head damage during the retrieval procedure. Various materials have been proposed to protect screw heads during the restoration of screw access channels including; the use of cotton wool pellets, polyvinylsiliconase (PVS) material, gutta percha, acrylic resin or utilizing custom-made cover screws.[9] Cotton wool pellets are filamentous and have the ability to harbor bacteria; consequently they are associated with malodor during screw access. PVS material and gutta percha can prove difficult to remove and become frustrating for the operator. Acrylic resin can flow into the screw head proving difficult to remove and risking damage to the screw head. The manufacture of lab-made custom cover screws is expensive and may not be readily available. The use of PTFE tape as a barrier between screw heads and restorative material has been suggested as a simple and cost effective alternative.[10]

PTFE is non-filamentous which enables it to be removed whole more easily than cotton wool; that is more likely to tear on withdrawal. The fibrous structure of cotton wool provides an ideal niche for bacteria to grow and cultivate when compared to PTFE. Furthermore, it cannot be compacted to the same density as PTFE and so may also provide dead space between the filaments where bacteria may thrive. As such it seems more practical to use PTFE for screw access holes to reduce bacterial presence within the chamber and for ease of retrievability.

**PTFE as a spacer for restorations**

In the unfortunate event a tooth supporting a crown has fractured, it is possible to repair the fractured tooth abutment chair-side. Chan *et al.* described using PTFE tape to assist building up a direct core.[11] After the contents of the crown are removed PTFE tape is adapted to the fit surface of the crown and it is filled with a suitable core material, the restoration is then seated on the remaining tooth abutment. The low surface energy of PTFE acts to prevent the auto-polymerizing resin from adhering to the internal crown surface whilst also providing the cement relief space. This method can be useful in an emergency situation where an anterior crown may be required for aesthetic purposes. However, this technique requires a minimum of 2 mm of supra-gingival tooth structure and an intact finish line to allow correct seating of the crown. The use of PTFE tape as a spacer material can also be applied to assist in obtaining an even cement film thickness during cementation of implant crowns. Chandur P.K *et al.* have suggested adapting PTFE tape to the fit surface of an implant crown and creating a copy abutment using a bite registration material. The crowns fit surface is thoroughly cleaned and filled with cement, the copy abutment is then inserted to allow even distribution of cement on the fit surface prior to definitive cementation. This method ensures an evenly distributed cement film thickness with minimal clean up after seating, however requires the use of a slow setting cement.

**Block-out material for impression making**

The control of impression material is important in preventing the ingress of material in unwanted areas. This is pertinent in regions where there are hard or soft tissue defects as a result of vertical bone loss from missing teeth or periodontal disease. The screw access channel of implant components is also an area in which impression material may occlude. Areas where the impression material may inter-lock such as deep gingival embrasure spaces can present a challenge when recording impressions.[12] Polymerized impression material engaged in the undercut of a bridge pontic or large gingival embrasure poses the risks of causing trauma and an unpleasant experience for the patient during removal, it may also prevent access to implant screws by obstructing the screw access channel

A method to avoid such a situation is to block-out undesirable voids by using pliable and removable materials, some include: ribbon wax, polymer-based materials, 'interdental wedges', or temporary fillings.[12,13] Although inexpensive, these methods can be time consuming and require time for removal of the residual material post impression. PTFE tape can be easily compacted to block out undercuts prior to impression making, with the advantage of straightforward removal without leaving residual material This method is only successful where there is a defined undercut allowing compaction of the tape; broad bony undercuts may be better blocked-out with wax as PTFE tape will be easily displaced here. This technique can also be implemented where an impression is required of patient with fixed orthodontic brackets, for example, for the construction of a mouth guard.

**Trial seating of extra-coronal restorations**

Prior to cementation of a restoration, performing a try-in to ensure optimal margins and both interocclusal and interproximal contact is considered good practice. This provides an opportunity for the patient to see the restoration and the clinician to make any necessary adjustments preceding formal cementation. The try-in stage can be challenging, particularly if the intended restorations are small or there are multiple crowns for cementation. Where preparations are especially retentive try-in can result in frictional binding, making subsequent removal of the restoration difficult prior to cementing definitively. This may be more relevant in situations where parallel walls are present or where delicate ceramic restorations can potentially fracture if unfavourable removal forces are applied. Various removal procedures have been proposed to overcome the difficulty in removing a restoration following trial insertion, including the use of flexible adhesive sticks, thermoplastic resin, a locator handle created on the restoration and also the use of an explorer or straight probe.[14] The use of PTFE tape to retrieve a well-fitting onlay has been described by Geissenberg *et al.*[14] By adapting PTFE tape onto the fit surface prior to trial seating, the clinician can safely retrieve the restoration with minimal risk of damage by drawing on the free ends of the PTFE tape and pulling the restoration free. The tape can also function as a 'fit checker' to inspect the fit surface of an indirect restoration for 'dark spots' following trial insertion, indicating an area of limited space or a premature contact and allowing for selective adjustment of localized spots.[15]

## 2. Conclusion

PTFE tape has some advantages over commonly used dental materials and may prove beneficial in certain clinical situations. These include and are not limited to: a tooth separation medium; screw access channels; impression and restoration recovery; assisting in cement clean up; and as a cement lute spacer. As with any dental material it is imperative the clinician makes a judgment of the intended use of the material and whether benefits outweigh the risk. highlights some of the advantages and disadvantages of using PTFE tape to assist in dental procedures. PTFE tape provides clinicians with a simple, readily available and cost effective material in their armamentarium, which can easily be incorporated into any dental practice

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