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EDITORIAL

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We have been fortunate to secure a marvellous and strong teaching faculty that is well experienced and open to new and innovative ideas. Under their guidance we are planning to start a short study program among under graduate students. We also ensure cultural, co-curricular activities in the campus which is very important for personality development.

Our mission is to create an equal opportunity for all students for their intellectual, emotional, cultural and physical development in order to grow up as the best of dental practitioners. I am sure that all of you will make the best use of the programmes offered, facilities provided and opportunities created here, in your interest.

Dr. Manoj Kumar KP
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ANTIBIOTIC PROPHYLAXIS : AN UPDATE

*Dr. Navia George,*Dr. Swetha Valsan

ABSTRACT

This paper is designed to provide scientifically based guidance to clinicians regarding the use of antibiotics in dental treatment based on the 2017 American Heart Association(AHA) and American College of Cardiology focused update of the 2014 AHA/ADA Guideline for Management of Patients with Valvular Disease and cited by the American Dental Association(ADA). The guidance in this article is not intended to substitute for a clinician's independent judgment in light of the conditions and needs of a specific patient.

Key words: antibiotic prophylaxis, 2017 update, patient management

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Endocarditis Prophylaxis and Recommendations

These recommendations are taken from 2017 American Heart Association and American College of Cardiology focused update of the 2014 AHA/ADA Guideline for Management of Patients with Valvular Disease and cited by the ADA.^{1,2}

Prophylaxis against infective endocarditis is reasonable before dental procedures that involve manipulation of gingival tissue, manipulation of the periapical region of teeth, or perforation of the oral mucosa in patients with the following:

In 2017, the AHA and American College of Cardiology (ACC) published a focused update³ to their previous guidelines on the management of valvular heart disease. This reinforced their previous recommendations that AP is reasonable for the subset of patients at increased risk of developing IE and at high risk of experiencing adverse outcomes from IE.³ Their key recommendations were:

1. Prosthetic cardiac valves, including transcatheter-implanted prostheses and homografts.
2. Prosthetic material used for cardiac valve repair, such as annuloplasty rings and chords.
3. Previous IE.
4. Unrepaired cyanotic congenital heart disease or repaired congenital heart disease, with residual shunts or valvular regurgitation at the site of or adjacent to the site of a prosthetic patch or prosthetic device.
5. Cardiac transplant with valve regurgitation due to a structurally abnormal valve.

The ADA and AHA have a downloadable wallet card available to providers at no cost to educate patients who may be at risk for IC.

http://www.heart.org/idc/groups/heart-public/@wcm/@hcm/documents/downloadable/ucm_448472.pdf

In 2017, the ADA reaffirmed the recommended regimen as follows:

			Regimen: Single Dose 30 to 60 min. <u>Before</u> <u>Procedure</u>
Situation	Agent	Adults	Children
Oral	Amoxicillin	2 g	50 mg/kg
Unable to take oral medication	Ampicillin OR Cefazolin or ceftriaxone	2 g IM* or IV+ 1 g IM or IV	50 mg/kg IM or IV 50 mg/kg IM or IV
Allergic to penicillins or ampicillin—oral	Cephalexin $\phi\delta$ OR Clindamycin OR Azithromycin or clarithromycin	2 g 600 mg 500 mg	50 mg/kg 20 mg/kg 15 mg/kg
Allergic to penicillins or ampicillin and unable to take oral medication	Cefazolin or ceftriaxone δ OR Clindamycin	1 g IM or IV 600 mg IM or IV	50 mg/kg IM or IV 20 mg/kg IM or IV
*IM: Intramuscular +IV: Intravenous ϕ Or other first- or second-generation oral cephalosporin in equivalent adult or pediatric dosage. δ Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria with penicillins or ampicillin.			

Patients with Joint Replacement

The following recommendation is taken from the ADA Chairsides Guide (© ADA 2015)

- In general, for patients with prosthetic joint implants, prophylactic antibiotics are not recommended prior to dental procedures to prevent prosthetic joint infection.
- In cases where antibiotics are deemed necessary, it is most appropriate that the orthopedic surgeon recommend the appropriate antibiotic regimen and when reasonable write the prescription

Additional Considerations

The practitioner and patient should consider possible clinical circumstances that may suggest the presence of a significant medical risk in providing dental care without antibiotic prophylaxis, as well as the known risks of frequent or widespread antibiotic use. As part of the evidence-based approach to care, this clinical recommendation should be integrated with the practitioner's professional judgment in consultation with the patient's physician, and the patient's needs and preferences.

These considerations include, but are not limited to:

- Patients with previous late artificial joint infection
- Increased morbidity associated with joint surgery (wound drainage/hematoma)
- Patients undergoing treatment of severe and spreading oral infections (cellulitis)
- Patient with increased susceptibility for systemic infection
- Congenital or acquired immunodeficiency

- Patients on immunosuppressive medications
- Diabetics with poor glycemic control
- Patients with systemic immune compromising disorders(e.g. rheumatoid arthritis, lupus erythematosus)
- Patient in whom extensive and invasive procedures are planned
- Prior to surgical procedures in patients at a significant risk for medication-related osteonecrosis of the jaw.

Special Circumstances

The 2007 AHA guidelines state that an antibiotic for prophylaxis should be administered in a single dose before the procedure.^{3,4} However, in the event that the dosage of antibiotic is inadvertently not administered before the procedure, it may be administered up to two hours after the procedure.

For patients already receiving an antibiotic that is also recommended for IE prophylaxis, then a drug should be selected from a different class; for example, a patient already taking oral penicillin for other purposes may likely have in their oral cavity viridans group streptococci that are relatively resistant to beta-lactams.

In these situations, clindamycin, azithromycin or clarithromycin would be recommended for AP. Alternatively if possible, treatment should be delayed until at least 10 days after completion of antibiotic to allow re-establishment of usual oral flora. In situations where patients are receiving long-term parenteral antibiotic for IE, the treatment should be timed to occur 30 to 60 min after delivery of the parenteral antibiotic;

it is considered that parenteral antimicrobial therapy is administered in such high doses that the high concentration would overcome any possible low-level resistance developed among oral flora.^{3,4}

References

1. Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP, 3rd, Fleisher LA, et al. 2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation* 2017.
2. ADA. Antibiotic prophylaxis prior to dental procedures. *Oral Health Topics* 2017 [cited 31st March 2017]; Available from: <http://www.ada.org/en/member-center/oral-health-topics/antibiotic-prophylaxis>
3. Wilson W, Taubert KA, Gewitz M, Lockhart PB, Baddour LM, Levison M, et al. Prevention of infective endocarditis: guidelines from the American Heart Association: a guideline from the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. *Circulation* 2007; 116:1736-54.
4. Wilson W, Taubert KA, Gewitz M, Lockhart PB, Baddour LM, Levison M, et al. Prevention of infective endocarditis: guidelines from the American Heart Association: a guideline from the American Heart Association Rheumatic Fever, Endocarditis and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. *J Am Dent Assoc* 2008;139 Suppl:3S-24S.

TEMPOROMANDIBULAR JOINT ARTHROSCOPY

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ABSTRACT

Arthroscopic surgery has been widely used for treatment of temporomandibular joint (TMJ) internal derangements and diseases for the last 40 years. Arthroscopy of the TMJ is a minimally invasive, beneficial tool in the management of patients with degenerative and inflammatory diseases of the TMJ, and it is imperative that future generations of surgeons should be trained in its use.

Key words: arthroscopy, temporomandibular joint, temporomandibular disorders, endoscopy

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Introduction

Arthroscopy is a technique for direct visual inspection of internal joint structures, including biopsy and other surgical procedures performed under visual control. In 1918 Takagi first described arthroscopy of the knee joint examinations using cystoscope (Tag, 1939). Onishi in 1970 was the first to report arthroscopy of the human temporomandibular joint (TMJ) and the first results were published by him (Onishi, 1975, 1980). The major surgical procedures that would follow to be used with the arthroscope were diagnostic, by attaching the arthroscope to a screen to visualize the joint and the lysis and lavage of the joint.

Temporomandibular joint disorder (TMD) is a term that encompasses a number of overlapping conditions. 80% of patients with signs and symptoms of TMD have some form of internal derangement of the temporomandibular joint (TMJ). Internal derangement is

an intra-articular condition in which there is a disruption in the normal relationship of the articular disc of the TMJ to the articular eminence and the condyle when the joint is at rest or in function. ID of the TMJ includes conditions such as anchored disc phenomenon, disc displacement with reduction, painful click, and closed lock. Patients with ID of the TMJ often complain of pain, joint sounds, and a limitation in mouth opening. More than 80% of patients with ID of the TMJ can be treated successfully with nonsurgical therapy. Non-surgical therapies include pharmacotherapy, TMJ splints, and physical therapy. Patients who do not respond to non-surgical therapy may require more invasive procedures, such as arthrocentesis and arthroscopy, or various surgical modalities such as disc repositioning by excision of retrodiscal tissue and intra articular suturing and disc repair, discectomy,

or discectomy and replacement (e.g., by auricular cartilage).

TMJ Anatomy

TMJ is a synovial joint between the head of mandibular condyle and the temporal glenoid fossa. The space between the head of mandibular condyle and the glenoid fossa of temporal bone is divided into two separate cavities by the articular disc. The inferior compartment is involved in the hinge movement of the joint, while the superior joint space participates in the translation movement. The post glenoid process and articular eminence are the posterior and anterior limitations of the articular space, respectively.

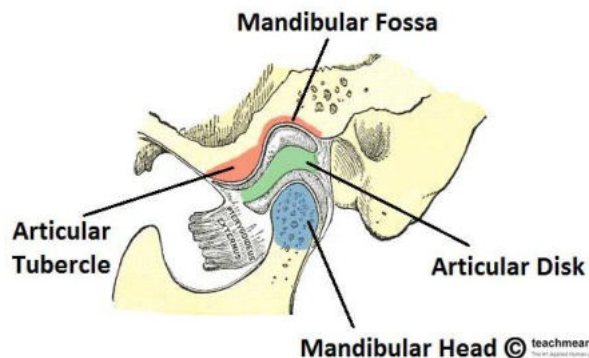


Fig 1: Anatomy of TMJ

TMJ is surrounded by a fibrous capsule called articular capsule, and its extension is the articular disc. The movements of TMJ are restricted by three main ligaments. The temporomandibular ligament is the lateral portion of articular capsule. This fan-shaped ligament is responsible for synchronizing the condyle and articular disc. The other two ligaments are sphenomandibular and stylomandibular ligaments which are involved

in controlling the mandibular movements. . The superior head of the lateral pterygoid muscle penetrates into the anterior portion of the disc, while posteriorly, the articular disc is connected to the retrodiscal tissue, a highly vascularized and innervated structure.

The temporomandibular, stylomandibular, and sphenomandibular ligaments are associated with the TMJ, and define the border movements of the mandible. The facial nerve has intracranial and extra cranial branches distal to the stylomastoid foramen, with the temporal, zygomatic, buccal, marginal mandibular, and cervical branches comprising the five major extra cranial facial branches. The temporal and zygomatic branches can be injured when approaching the TMJ, as detailed below.

The trigeminal nerve, responsible for sensory function in the face and motor innervation to the mastication muscles, is another important nerve which must be preoperatively identified. The auriculotemporal nerve is a branch of the mandibular nerve (V/1) that runs with the superficial temporal artery and vein. It passes between the neck of the mandible and the sphenomandibular ligament in proximity to the fossa puncture site. The most important blood vessels in this region are the superficial temporal artery and vein. The superficial temporal artery is the smaller of two terminal branches of the external carotid artery and passes behind the neck of the condyle, superficially over the posterior root of the zygomatic process of the temporal bone, before splitting into frontal and parietal branches.

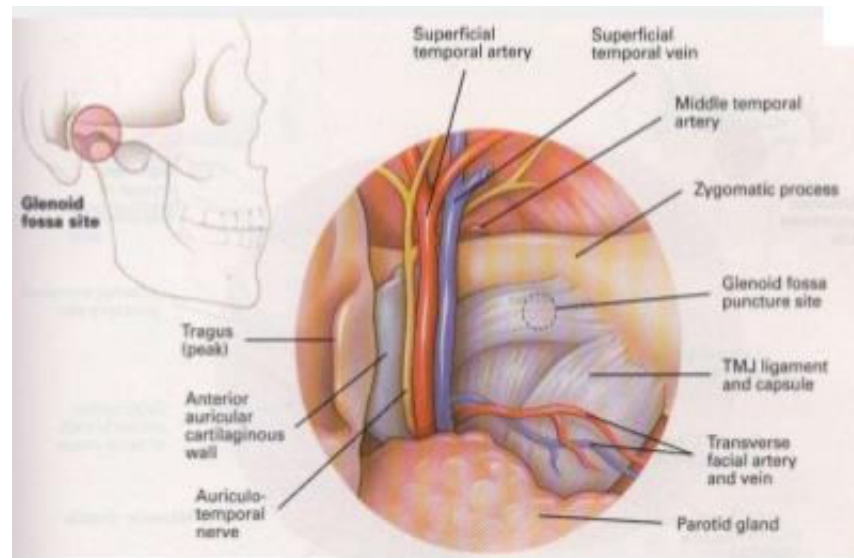


Fig 2: Blood supply to TMJ

Indications for arthroscopy

Internal derangement of TMJ, mainly Wilkes stages II, III, and IV (Disc displacement, Disc deformity)

- Inter articular adhesion
- Degenerative arthritis
- Osteoarthritis
- Chronic forms of arthritis
- Post traumatic change
- Pseudotumors

Contraindications

- Acute infection
- Bony ankyloses
- Risk of tumour dissemination
- General medical contraindication
- Anatomical variations.

The most commonly used classification to describe the severity of ID was proposed by Wilkes in 1989 based on clinical, radiologic, and intraoperative findings.

Wilkes' staging for internal derangement of the TMJ

I. Early stage

- a) Clinical presentation: no pain or decreased range of motion, possible clicking
- b) Radiographic presentation: disk anteriorly positioned, normal bony contours
- c) Anatomic correlation: anterior displacement, normal anatomic form of bone, and disk

II. Early/intermediate stage

- a. Clinical presentation: episodes of pain, opening clicks, intermittent locking
- b. Radiographic presentation: anterior disk displacement, thickened posterior disk, bony contours normal
- c. Anatomic correlation: early disk deformity, anterior displacement, normal bony contours

III. Intermediate stage

- Clinical presentation: many painful episodes, intermittent closed locking,
- multiple functional symptoms, decreased range of motion
- Radiographic presentation: anterior disk displacement with disk deformity
- Anatomic correlation: marked disk displacement and deformity, normal bony contour

IV. Intermediate/late stage

- Clinical presentation: increased pain relative to earlier stages
- Radiographic presentation: bony changes, such as flattened eminence, condylar deformity, osteosclerotic changes
- Anatomic correlation: adhesions of disk, bony changes, evidence of osteoarthritis, osteophytes, no disk perforations.

V. Late stage

- Clinical presentation: episodic or continuous pain, crepitus, limited range of motion at all times, constant functional difficulties
- Radiographic presentation: disk perforations, gross deformities of bony subcortical cysts.

Technique for arthroscopy

Arthroscopy is performed under nasotracheal general anaesthesia which makes possible to manipulate the mandible during the operation. First the zygomatic arch and the condyle are palpated. The condyle is then forced in anterior position by the assistant and the preauricular concavity is formed in the skin, marking a point for the injection. Usually

arthroscope KARL STORZ GmbH & Co.KG is used. Although various arthroscopic approaches to the TMJ have been described, the one most commonly used is the posterolateral approach to the upper joint space. After the condylar head of the TMJ has been determined, a marking line and puncture points are made on the skin surface.

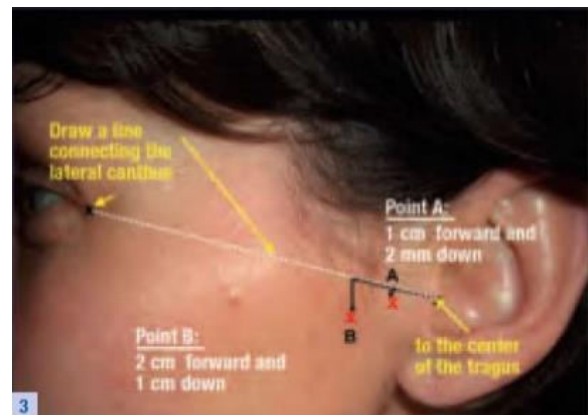


Fig 3: Planning the trocar sites for arthroscopy



Fig 4: Arthroscope Karl Storz

The puncture site is located by manipulating the mandible antero-inferiorly. For distension of the superior compartment and in order to avoid iatrogenic damage to the cartilaginous surfaces during introduction of the trocar, 1% lidocaine solution 2,0 mL is inserted. The needle is aimed in a medial and slightly

anteriosuperior direction until the contact with the glenoid fossa is achieved.

The posterior recess of the superior joint space is reached when there is a backflow into the syringe of the solution injected into the joint space. Through the small skin incision 0.75 – 1.0 cm from the centre of the tragus at the injection site the lateral capsule is punctured with a sharp trocar in an arthroscopic sheath inserted in the same direction as the previous injection needle. The sharp trocar is exchanged for a blunt one and the arthroscopic sheath is advanced further into the upper joint space.

Puncture with arthroscope sheath (trocar) with a blunt obturator inserted into upper posterior recess is performed angling it medially upward ~ 2.5 cm. Another skin incision is made ~ 0.75 cm from the first skin incision in anterolateral direction for outflow cannula to be inserted into the upper joint anterior recess. Following insertion of the trocar (diameter 1.8 mm, length 4 cm) into the joint space, blunt obturator is removed and forward-oblique telescope 30° (HOPKINS®), diameter 1.9 mm, length 6.5 cm, fibre optic light transmission incorporated is inserted arthroscopy has been completed, either forceps, palpation hook or blunt probe are used to cut fibres, mainly fibres of the pterygoid muscle anterior to the disc, in order to reduce pull in the anterior direction and facilitate repositioning of the disc. Cutting of adhesions facilitate repositioning of the disc.

During arthroscopy a sweeping procedure between the disc and fossa release the adhesions and fibrillations increasing the mobility in the joint. Release of the adhesions and fibrillations of the superior surface of the

disc and shaving the surface of articular fossa in the upper joint compartment are performed with the aid of a blunt obturator or hook and with grasping forceps, scissors or double-edged knife. Removal of the superficial layer of cortical bone induces capillary bleeding stimulating formation of fibrocartilage on bone. Quite often a displaced disc may be found during arthroscopy.

Surgical procedure is completed by irrigating the joint space to remove small tissue fragments. The outflowing fluid is collected and may be retained for diagnostic purposes. Arthroscopic lysis and lavage includes also a lateral release of the upper joint compartment performed with the blunt obturator or hook. Thus the locked disc could be mobilized sufficiently.

Arthroscopic findings are as follows:

Irregularities of joint surfaces, folding and synovitis – hyperaemia of the inner wall, localising also in the posterior part of the disc, intra-articular fibrous adhesions, intracapsular adhesions, fibrillations of superior surface of the disc and arthritic lesions of temporal cartilage, pseudo walls, foreign bodies - chondromatosis.



Fig 5: Synovitis

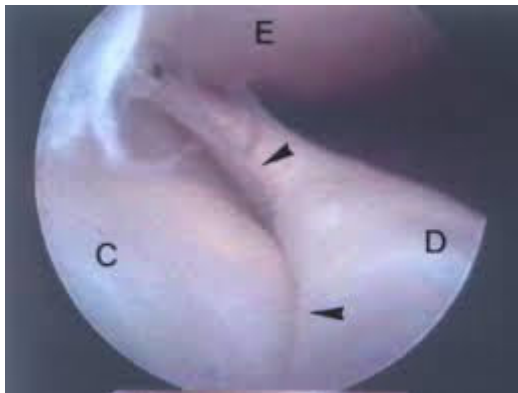
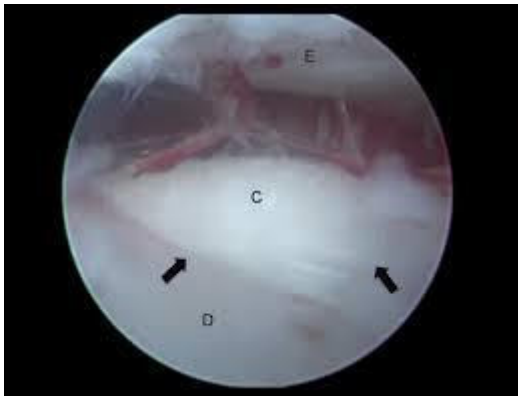


Fig 6a&b: Disc perforations



Fig 7: Fibrillations

Complications

Complications during or after TMJ-arthroscopy are uncommon, being usually mild and transient with incidence varying between 0% and 15%. The major portion of

complications was otologic problems, including blood clots in the external auditory meatus, perforation of the tympanic membrane, partial hearing loss, ear fullness, and vertigo.



Fig 8: Adhesions

Neurologic Lesion of the auriculotemporal nerve, Paresia of the seventh nerve, Paralysis of the seventh nerve, Lesion of the inferior alveolar nerve, Cardiac disturbances (trigemino-cardiac reflex), Vascular Arteriovenous fistula, Ocular Alteration of visual accuracy, Infection, Instrument breakage.

New concepts

The improvements in camera and lens technology have advanced the ability to diagnose a wide variety of pathologic conditions within the TMJ. The Onpoint 1.2 mm Scope System is an innovative breakthrough that provides minimally invasive visualization of the joint in the convenience of an office-based setting. The button on the hand piece allows still image and video recording for the visual effect of patient instruction, and visualization and smaller size could prevent complications. The

disposable fiberoptic scope tube is approximately the size of an 18-gauge needle and is sterile packaged for single use. The Onpoint system is a single-portal system, thereby requiring only one puncture of the joint, and the new fiberoptic design tolerates more flexion to help avoid tissue trauma.

Arthroscopic laser surgery(holmium: YAG laser) also produces significantly less tissue damage because the laser has less penetrance into surrounding tissue, allowing a surgeon to cut and ablate tissue while minimizing iatrogenic damage.

Endoscopic arthrocentesis & lavage

Aggressive protein components resulting from inflammatory effusion can be washed out under optical control. Endoscopes supply magnified & detailed image of change in cartilage, bone, ligaments & the synovial membrane. In addition to affording patients the positive effects of arthrocentesis & lavage, this endoscopic procedure allows removing minor adhesion under view.

A. Anterior and Posterior Recess Adhesion Release

Sequential lysis of adhesions in the superior joint space, aimed at restoring the volume and architecture of the joint, should follow an anterior-to- posterior pattern, avoiding repeated motion of instrumentation from the back to the front of the joint, which could increase the risk of unnecessary articular surface scuffing. For this procedure, the authors prefer the highly versatile Ho:YAG laser, set on cutting mode, over the probe.

B. Synovectomy

Effective reduction of a redundant synovium can be performed via Ho:YAG-assisted OSCA. A redundant synovium is most often observed in the posterior pouch, especially after disc reduction procedures. Occasionally, it can be encountered in the anterior recess. Hypervascularity and redundancy can effectively be reduced by Ho:YAG laser vaporization. The synovial clinical response is manifested by a change in color from bright red to off-white or even a light brown.

C. Anterior Release

Conditions such as chronic disc dislocation, fibrosis, adhesive bands, or pseudowall formation can obliterate the disc-synovial crease. A blunt probe is used for the lysis procedure. If the anteroposterior disc dimension appears adequate and a relatively normal disc shape is ascertained, the release procedure is initiated in the medial half of the disc-synovial crease.

D. Posterior Scarification/ Contracture

Once disc reduction is achieved, an increased amount of redundant synovium is noted in the retrodiscal flexure. Even with minor disc repositioning and less evidence of redundancy of the posterior synovium, in the absence of discopexy, this procedure should be performed. Typically, “reefing,” or bunching up, of the retrodiscal tissue occurs and requires bulk reduction using an Ho:YAG laser; otherwise, this fairly large amount of tissue can fibrose during healing, which can later displace the disc upon postoperative settling.

E. Intra-articular Delivery of Medications

Before the advent of arthroscopy, intra-articular medications were injected using a blind technique. The ARTHROSCOPIC technique enables visually guided injection of medications, specifically targeting various anatomic articular sites EG:- Steroids, Botulinum Toxin A, Hyaluronic Acid.

F. Debridement

Arthrotomy

Although some patients with temporomandibular joint (TMJ) disorders are successfully treated by nonsurgical means or by arthrocentesis or arthroscopic surgery, there is still a group of patients who do not respond to these procedures and for whom an arthrotomy and disc surgery (discoplasty) are necessary. Bony ankylosis and fibrosis are best managed by open arthrotomy procedures. Arthrotomy includes not only a discoplasty but also high condylar shave and eminectomy.

Conclusion

Arthroscopy is a minimally invasive surgery that can effectively treat TMDs. Arthroscopy has a diagnostic and therapeutic role in the management of temporomandibular joint disorder and it is done regularly using a specific technique. Its accuracy in diagnosing TMD is high and simultaneous biopsy can be performed to improve diagnostic accuracy. Arthroscopic findings then help to decide whether open operation would be appropriate if the patient fails to respond to arthroscopy. The pathway of arthroscopy with simultaneous arthrocentesis reduces the need for open surgical procedures when intraoperative findings suggest anatomicopathological derangements, which can be treated using an open approach.

References

1. Murakami K. Rationale of arthroscopic surgery of the temporomandibular joint. *J Oral Biol Craniofac Res.* 2013 Sep 1;3(3):126-34.
2. White RD. Arthroscopy of the temporomandibular joint: technique and operative images. *Atlas of the oral and maxillofacial surgery clinics of North America.* 2003 Sep;11(2):129-44.
3. Thomas SM, Matthews NS. Current status of temporomandibular joint arthroscopy in the United Kingdom. *Br J Oral Maxillofac Surg.* 2012 Oct 1;50(7):642-5.
4. Textbook of Arthroscopy Of Temporomandibular joint By Wolfram M.H.Kaduk.
5. Murakami K, Moriya Y, Goto K, Segami N. Four-year follow-up study of temporomandibular joint arthroscopic surgery for advanced stage internal derangements. *J Oral Maxillofac Surg.* 1996 Mar 1;54(3):285-90.
6. Srouji S, McCain J. Modern Temporomandibular Joint Arthroscopy: Operative Single-Cannula Arthroscopy. In *Minimally Invasive Oral and Maxillofacial Surgery* 2018.Springer, Berlin, Heidelberg(pp. 21-44).
7. Smolka W, Yanai C, Smolka K, Iizuka T. Efficiency of arthroscopic lysis and lavage for internal derangement of the temporomandibular joint correlated with Wilkes classification. *Oral Surg Oral Med Oral Pathol Oral Radiol Endodontol.* 2008 Sep 1;106(3):317-23.

8. Tzanidakis K, Sidebottom AJ. Outcomes of open temporomandibular joint surgery following failure to improve after arthroscopy: is there an algorithm for success? Br J Oral Maxillofac Surg. 2013 Dec 1;51(8):818-21.
9. Muñoz-Guerra MF, Rodríguez-Campo FJ, Hernández VE, Sánchez-Acedo C, Usandizaga JL. Temporomandibular joint disc perforation: long-term results after operative arthroscopy. J Oral Maxillofac Surg. 2013 Apr 1;71(4):667-76.

ADHESIVE-RESINS IN OBTURATION

*Dr.Anup PT, **Dr.Ramesh Kumar M,***Dr.Elsy P Simon,**** Dr.Chandini Raveendran

ABSTRACT

Gutta-percha has been in use for many decades as an obturation material matched with various sealers, but its drawbacks have long been recognized. Coronal leakage has become a growing concern in the long-term success of endodontics. Gutta-percha cannot be bonded with any sealer and, therefore, it can provide a bacterial pathway to reinfection of the tooth's apical region. Science and technology have advanced obturation in recent years to provide better seals with greater coronal leakage prevention. . This review article goals to deliver an ephemeral synopsis of this obturating system with adhesive resins with a reference of the studies associated with it.

Key words: obturation, gutta-percha, resin adhesives

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Introduction

Root canal filling typically involves the use of a core material, as gutta-percha does not bond to root dentine and therefore must be used in association with a sealer to provide a bond between the core material and the root canal wall, along with filling any gaps, lateral accessory canals and irregularities at the root canal wall.¹ Recently, adhesive dentistry has been introduced to the field of endodontics with a specific focus on obtaining a 'monoblock' in which the core material, sealing agent, and the root canal dentine form a single cohesive unit.² Very little has been published on the use of adhesion in filling root canals. It stands to reason that adhesive resins could serve to seal dentinal walls after smear layer removal. If it can be made to adhere to other filling materials such as gutta-percha and if it can be made radio-opaque without ruining its setting and adhesive qualities, one

would think that adhesives might have a bright future in endodontics.^{3,4}

Epoxy resin-based sealers

Epoxy resin-based sealers like AH 26 are a mixture of epoxy amines which have been available as root canal sealers for many years. They are generally placed in the canal without any dentine surface treatment or dentine adhesive and can be used with any obturation technique.⁵ These sealers have a hydrophobic nature which are thought to be able to react with any exposed amino groups in collagen to form covalent bonds between the resin and collagen when the epoxide ring opens.⁶ They have been shown to achieve high bond strengths to both dentine (2.06 MPa) and gutta-percha (2.93 MPa).⁷

Their drawbacks include cytotoxicity to primary human oral fibroblasts arising from

the release of bisphenol A diglycidyl ether and minute amounts of formaldehyde from the sealer.⁸

Methacrylate resin-based sealers

This type of bondable root canal sealer has been promoted with the highly desirable property of creating monoblocks within the root canal space.⁹ Methacrylate resin-based sealers have attracted considerable attention because of their hydrophilic characteristics that enable them to wet canal walls and penetrate dentinal tubules⁹, their bondability to radicular dentine and their potential bondability to root canal filling materials.¹⁰

Generations of methacrylate resin-based sealers

First generation of bondable sealer

Hydron

They are hydrophilic due to the presence of poly[2-hydroxyethyl methacrylate] (poly [HEMA]).¹¹ They are easy to use because of its injectability, biocompatibility, high adaptability to the canal walls and being non-supportive of bacterial growth. But they cause severe inflammatory reactions, absorption of the material and severe leakage.¹²

Second generation of bondable sealer

This generation does not depend on separate dentine conditioning. It uses non-acidic, hydrophilic resin monomers to enhance sealer penetration into dentinal tubules after the removal of the smear layer to facilitate resin tag formation for retention.¹³

EndoRez

EndoREZ (UDMA based sealer) is very effective in penetrating dentinal tubules and

adapting closely to the root canal walls.¹⁴ EndoRez has an accelerator to facilitate its rapid curing does not utilise a dentine bonding system and is mainly used with single gutta-percha cone techniques.¹⁵ EndoREZ points are also available which are conventional guttapercha cones coated with a proprietary resin coating.¹⁶ Clinical studies reported with low bond strengths to dentine when obturated with EndoREZ points.¹⁷

Third generation of bondable sealer

This generation incorporate smear layer created by root canal instruments in the sealer-dentine interface by using separate self-etching primer.¹⁸

FibreFill

Fibre fill root canal sealant) is a radiopaque dual cure third generation methacrylate resin sealer based on UDMA, used in combination with a self-cured, self-etching primer system. Self-etching creates micromechanical interlocking between the dentine collagen and resin, forming a hybrid layer. This system was designed for filling canals with fibre-reinforced obturators that are attached to a thermoplastic root filling material tip. The apical 5 to 8 mm of the obturator is gutta-percha and the coronal two-thirds consist of a resin and glass fibre post that is adhesively bonded within the tooth during the obturation, sealing the coronal portion and providing retention for the core.¹⁹ FibreFill root canal sealant is reported to have a good sealing ability and adhesive properties to radicular dentine, but presence of debris will reduce the adhesive properties.²⁰

Resilon/Epiphany

This system uses a self-etching primer and comprises a Resilon cone, which is a thermoplastic synthetic material (polycaprolactone) that contains bioactive glass, bismuth oxychloride, and barium sulphate to replace gutta-percha and conventional sealers.²¹ The sealer matrix consists of bisphenol-A-glycidyl dimethacrylate, ethoxylated Bis-GMA, UDMA, and hydrophilic methacrylate with calcium hydroxide, barium sulphate, barium glass, bismuth oxychloride and silica.²² A resinous solvent (Epiphany Thinning Resin) which is an aqueous solution and consists of ethoxylated bisphenol-A-dimethacrylate (EBPADMA) resins with photo-initiators, amines, stabilisers and pigments also comprises this system.²³ Chemical coupling of the methacrylate-based sealer to Resilon is very weak, but chemical bond between the sealer and the Resilon points might be the reason for significantly better adaptation to the points.²⁴ They lack solubility, dimensional stability²⁵ and does not possess antimicrobial action.²⁶

RealSeal

The system includes primer, sealer and core material. The sealer contains UDMA, polyethylene glycol dimethacrylate (PEGDMA), ethoxylated bisphenol A dimethacrylate and 2,2-bis[p-(2-hydroxy-3-methacryloxypropoxy) phenyl] propane (Bis-GMA) resins, silane treated barium borosilicate glass, barium sulphate, silica, calcium hydroxide, bismuth oxychloride with amines, peroxide, photoinitiator, and pigments. RealSeal core material contains 57% polyester polymer polycaprolactone, and

42% bioactive glass and radiopaque fillers.²⁷ They have higher shear bond strength and is proved to be biocompatible.²⁸

Fourth generation of bondable sealer (self-adhesive sealers)

The fourth generation of methacrylate resin-based sealers is comparable to self-adhesive resin luting materials in that both were designed with the intention of combining a self-etching primer and a moderately filled flowable composite into a single product.²⁹ The combination of an etchant, a primer and a sealer into an all-in-one self-etching, self-adhesive product is advantageous in that it reduces the application time as well as errors that might occur during each bonding step. They are designed to integrate canal wall smear layer into the sealer-dentine interface.³⁰

MetaSeal

MetaSeal, a hydrophilic and self-adhesive sealer, is recommended for use exclusively with cold compaction or single-cone techniques.³¹ According to the manufacturers, MetaSeal has low cytotoxicity and is thus biocompatible both at the cellular and at the tissue levels; however a recent study revealed that MetaSeal was severely cytotoxic.³²

RealSeal SE and RealSeal 1

RealSeal SE uses a polymerisable methacrylate carboxylic acid anhydride (4-META) as the acidic resin monomer and can be used with Resilon cones or pellets by using cold lateral or warm vertical compaction techniques or with the more recently introduced RealSeal 1 carrier-based Resilon obturator system. In the RealSeal 1 bonded

obturation system, the carrier is a polysulphone-containing polymer with radiopaque filler, and the surrounding Resilon-based filling contains polycaprolactone and polyolefin polymers loaded with fillers. This product combines adhesive bonding technology with a carrier product and aims to provide the benefits of an efficient obturation technique combined with optimal leakage resistance. They resist bacterial penetration effectively and has high push out bond strength and provides a more impermeable seal to coronal leakage. Studies shown that if smear layer not removed using EDTA, they will not bond well to radicular dentin.

Smart seal

Smartseal is a two-part system comprising of Propoint and Smartpaste / Smartpaste Bio. Propoint, best known as the 'C points', these obturation points are fabricated in two parts: Central Core and the Outer Layer. The central core comprises of a blend of two branded nylon polymers, Trogamid T and Trogamid CX. The Outer Polymer Layer comprises of a cross-linked copolymer of acrylonitrile and vinyl pyrrolidone that has been cross-linked using allyl-methacrylate and a thermal initiator. This layer is hydrophilic, having a hydrogel coating, that allows swelling up of the points to acclimatize the corollaries of the root canal system. This covering is planned to swell sideways, thus self-sealing the root canal. As there is no axial swelling, no length change is present and radiated swelling halts as soon as a seal is formed. Smartpaste is a resin based sealer comprising of an active polymer that swells to fill any spaces or

openings in the root canal system. . One of the main benefits of this obturating system is the resourcefulness of the product, thus allowing the conception of points to equal most of the available different file systems that are presently used in daily practice.

Conclusion

There has not really been any paradigm shift in adhesive root canal filling material that can perfectly obturate the canal space. Even in adhesive resin root canal filling materials, despite the hybridisation, a perfect seal of the root canal is difficult to achieve, which may be a result of the complexity of the substrate and the high C-factor. New materials that can perfectly obturate the canal space with a gap-free solid mass has to be invented.

References

1. Johnson WT, Gutmann JL. Obturation of the cleaned and shaped root canal system. In: Cohen S, Hargreaves KM (eds). Pathways of the pulp, ed 9. St Louis, MO: Mosby, 2006:358–99.
2. Fisher MA, Berzins DW, Bahcall JK. An in vitro comparison of bond strength of various obturation materials to root canal dentine using a push-out test design. J Endod 2007;33:856–8.
3. Hanada T, Quevedo CG, Okitsu M, Yoshioka T, Iwasaki N, Takahashi H, Suda H: Effects of new adhesive resin root canal filling materials on vertical root fractures. Aust Endod J. 2010 Apr;36(1):19-23.
4. Cornelis H. Pameijer, Osvaldo Zmener: Resin Materials for Root Canal

- Obturation. *Dent Clin N Am*. 2010; 54: 325–44.
5. Macchi RL, Capurro MA, Herrera CL, et al. Influence of endodontic materials on the bonding of composite resin to dentine. *Endod Dent Traumatol* 1992; 8:26–9.
 6. Nunes V, Silva RG, Alfredo E, et al. Adhesion of Epiphany and AH Plus sealers to human root dentine treated with different solutions. *Braz Dent J* 2008;19:46–50.
 7. Gogos C, Economides N, Stavrianos C, et al. Adhesion of a new methacrylate resin-based sealer to human dentine. *J Endod* 2004;30:238–40.
 8. Cohen BI, Pagnillo MK, Musikant BL, Deutsch AS. Formaldehyde from endodontic materials. *Oral Health* 1998; 88:37–9.
 9. Tay FR, Pashley DH. Monoblocks in root canals: a hypothetical or a tangible goal. *J Endod* 2007;33:391–8.
 10. De-Deus G, Namen F, Galan J Jr., Zehnder M. Soft chelating irrigation protocol optimizes bonding quality of Resilon/ Epiphany root fillings. *J Endod* 2008; 34:703–5.
 11. Liu Q, Hedberg EL, Liu Z, Bahulekar R, Meszlenyi RK, Mikos AG. Preparation of macroporous poly (2-hydroxyethyl methacrylate) hydrogels by enhanced phase separation. *Biomaterials* 2000; 21: 2163–9.
 12. Teixeira FB, Teixeira EC, Thompson J, et al. Dentinal bonding reaches the root canal system. *J Esthet Restor Dent* 2004; 16:348–54.
 13. Bergmans L, Moisiadis P, De Munck J, Van Meerbeek B, Lambrechts P. Effect of polymerization shrinkage on the sealing capacity of resin fillers for endodontic use. *J Adhes Dent* 2005; 7:321–9.
 14. Hammad M, Qualtrough A, Silikas N. Extended setting shrinkage behavior of endodontic sealers. *J Endod* 2008; 34:90–3.
 15. Schwartz RS. Adhesive dentistry and endodontics: part 2: bonding in the root canal system: the promise and the problems—a review. *J Endod* 2006; 32: 1125–34.
 16. Haschke E. Adhesive endodontic cones and related methods. United States Patent Application 20040202986. US Patent & Trademark Office, October 14, 2004.
 17. Eldeniz AU, Erdemir A, Belli S. Shear bond strength of three resin based sealers to dentine with and without the smear layer. *J Endod* 2005; 31: 293–6.
 18. Watanabe I, Nakabayashi N, Pashley DH. Bonding to ground dentine by a phenyl-P self-etching primer. *J Dent Res* 1994;73:1212.
 19. Shipper G, Trope M. In vitro microbial leakage of endodontically treated teeth using new and standard obturation techniques. *J Endod* 2004;30:154–8.
 20. Gogos C, Economides N, Stavrianos C, et al. Adhesion of a new methacrylate resin-based sealer to human dentine. *J Endod* 2004;30:238–40.
 21. Onay EO, Ungor M, Ozdemir BH. In vivo evaluation of the biocompatibility of a new resin-based obturation system. *Oral*

- Surg Oral Med Oral Pathol Oral Radiol Endod 2007;104:60–6.
22. Shipper G, Ørstavik D, Teixeira FB, Trope M. An evaluation of microbial leakage in roots filled with a thermoplastic synthetic polymer-based root canal filling material (Resilon). J Endod 2004; 30:342–7.
 23. Skrtic D, Antonucci JM. Dental composites based on amorphous calcium phosphate - resin composition/ physico-chemical properties study. J Biomater Appl 2007; 21:375–93.
 24. Herbert J, Bruder M, DDS, Braunsteiner J, et al. Apical quality and adaptation of Resilon, Endorez, and Guttaflow root canal fillings in combination with a non-compaction technique. J Endod 2009; 35: 261–4.
 25. ANSI/ADA. Specification no.57: endodontic sealing material. Chicago: ANSI/ADA, 2000.
 26. Melker KB, Vertucci FJ, Rojas MF, et al. Antimicrobial efficacy of medicated root canal filling materials. J Endod 2006;32:148–51.
 27. Williams C, Loushine RJ, Weller RN, et al. A comparison of cohesive strength and stiffness of Resilon and gutta-percha. J Endod 2006;32:553–5.
 28. Lee BS, Lai EH, Liao KH, et al. A novel polyurethane-based root canal-obturation material and urethane-acrylate-based root canal sealer-part 2: evaluation of push-out bond strengths. J Endod 2008; 34:594–8.
 29. Radovic I, Monticelli F, Goracci C, et al. Self-adhesive resin cements: a literature review. J Adhes Dent 2008;10:251– 8.
 30. Kim YK, Grandini S, Ames JM, et al. Critical review on methacrylate resin-based root canal sealers. J Endod 2010; 36:383–99.
 31. Lawson MS, Loushine B, Mai S, et al. Resistance of a 4-META-containing, methacrylate-based sealer to dislocation in root canals. J Endod 2008;34:833–7.
 32. Al-Hiyasat AS, Tayyar M, Darmani H. Cytotoxicity evaluation of various resin based root canal sealers. Int Endod J 2010;43:148–53.
 33. Mai S, Kim YK, Hiraishi N, et al. Evaluation of the true self-etching potential of a fourth generation self-adhesive methacrylate resin-based sealer. J Endod 2009;35:870–4.
 34. Palmer NOA. An investigation of current endodontic practice and training needs in primary care in the north west of England. Br Dent J. 2009; 206(11):22-5.
 35. Pathivada L, Munagala KK, Dang AB. Annals Dent Speciality 2013; 1(1):13-5.

SELF-LIGATING BRACKETS: FORGET THE TWISTS AND TIES

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ABSTRACT

Self-ligating bracket system is known as the future of Orthodontics. The basic design of bracket evolved dramatically from Angle's edgewise bracket to self- ligating brackets. They allow the Orthodontist to choose the type of wire and ideal force levels that will be most efficient in the early stages of a patient's treatment, most notably for levelling and aligning as well as correcting rotations. Concept of self -ligating brackets was not new to Orthodontics. It was existing for a surprisingly long time. But newer designs of these brackets have continue to appear even today. This continued popularity of self-ligating brackets attracted more than a small percentage of consumers. This review deals with the differences of self-ligating brackets from conventional brackets, its features, advantages, disadvantages, and clinical applications of self-ligating brackets.

Key words: orthodontics, self ligating brackets, patient management

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Introduction

Self-ligating brackets are ligature-less bracket systems that has a mechanical device built into the bracket to close off the edgewise slot. The cap holds the arch wire in the bracket slot and replaces the elastomeric ligature. They are known as low friction brackets with utilising lighter forces to move teeth because there is much less friction in the system to overcome.¹ The design of self-ligating bracket is based on the principle that the force used to reposition teeth should not overwhelm the specialised tissues surrounding and supporting the teeth.²

Self-ligating brackets place enough force on the tooth to stimulate tooth movement without completely disrupting the vascular supply.

This makes the tooth movement more effective and physiologic. The design in the passive self-ligating brackets enables the teeth to move in the pathway of least resistance.³

Classification⁴

- a) On the basis of action of the slide
 - Active
 - Passive
- b) On the basis of design
 - Single self – ligating system
 - Twin self-ligating system
- c) On the basis of position of clip
 - Cap type

- Clip type
 - Clamp type
- The differences between self-ligating and conventional bracket system is given in table 1:

Table 1 – Difference between Self- ligating brackets and Conventional brackets

	SELF - LIGATION	CONVENTIONAL
Esthetics	Some designs permits significant miniaturization	Limited miniaturization
Force level	Permits use of lighter forces	Requires heavier level force
Force density	Light initial force	Higher initial force
Friction	Predictable, very low	Stainless steel : high Elastomeric very high
Infection control	Significantly reduced risk of percutaneous injury	Increased risk of percutaneous injury
Instrumentation	Fewer instruments are required during arch wire change	Many instruments are required during arch wire change
Ligation	Movable, integral part creates outer fourth wall	Stainless steel or elastomeric ligatures
Ligation stability	Retains original throughout treatment	Loses initial shape and tightness
Office visits	Shorter, less frequent visits	Longer, more frequent visits
Oral hygiene	Wingless designs easy to clean	Difficulty to treat food traps
Patient comfort	Only slight discomfort With Wire changes	Teeth usually sore after ligation
Mechanics	Ideally situated for tooth translation	Slow
Treatment time	Overall treatment reduced by about four	Longer, especially in extraction

Advantages

1. More certain full arch wire engagement
2. Low friction between bracket & arch wire
3. Less chair side assistance and faster arch wire removal and ligation
4. Reduced overall treating time
5. Reduces the risk of percutaneous injuries & transmission of diseases like HBV, HCV, HIV
6. Superior to conventional appliances in treating patients with complications such

as haemophilia, swollen gingival tissue due to persistent mouth breathing

7. Efficient treatment

Disadvantages

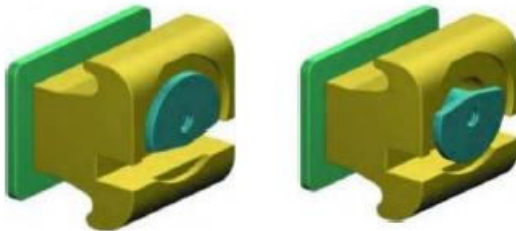
1. High cost
2. Trouble expressing minor tooth movements
3. Increased size causes occlusal interferences in lower anterior positions



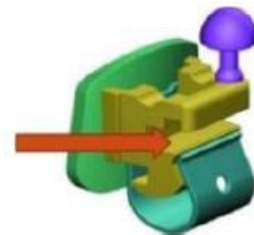
Russel lock edgewise attachment



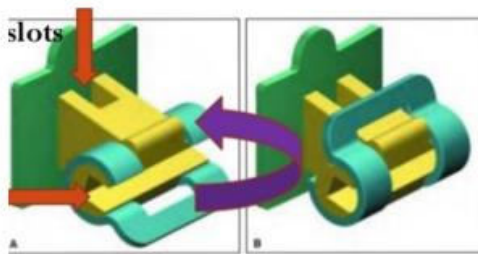
Edgeloek bracket



Mobilock bracket



Speed Lock bracket



Activa bracket



Time bracket



Damon 1



Damon 2



Damon 3

Damon brackets

Features of self-ligating brackets

1. *Arch flow* – Distal movement of self-ligating bracket can be compared with flow of liquid. The bracket and arch wire

move in union because of the arm and arch deflections, which are constantly changing position. More flexible arch wire deflections contribute to flow

mechanics. This produces less friction than circumferential elastomeric chain or metal ligatures used for arch wire engagement. Free distal flow makes initial auto rotations less restricted and distal drift of teeth more efficient.

2. *Acculock* - Precision arm locks the arch wire within the dimensions of the slot in an all or nothing pattern. This secure robust ligation which is very resistant to indent loss of ligation. Full arch wire engagement in self-ligating brackets maximises the potential long range of action of modulus wire.⁶
3. *Autoseat* – Early rotation control
4. *Arch flexibility* – Low friction of the resilient and flexible stainless steel precision arms reduce inter-bracket arch wire deflections resulting in free, biocompatible three dimensional tooth movements and accurate distal drift.
5. *Anchorage conservation* – Low friction of interactive brackets allows the application of consistent, light forces for efficient flow mechanics during retraction. This reduces posterior anchorage loss. Lower net force deflects arch wire less and facilitate release of binding force between arch wire and bracket enhancing sliding of bracket along the arch wire.⁷
6. *Asepsis* – Four tie-wing undercuts are left open for the self-cleansing effects of salivary fluids.
7. Comfortable for the patients
8. *Adaptation* – Flexible arch wires is not bound by ligatures so the vertical elastics over the open tie wings will work with low friction, to provide excellent dental

adaptation and ideal occlusal inter digitation.

9. Patient acceptance- Less frequency and duration of visit.

Types of self – ligating brackets⁸

- Russel lock edgewise attachment
- Edgelock bracket
- Mobilock bracket
- Speed bracket
- Activa bracket
- Time bracket
- Damon bracket
- Damon XS bracket
- Twin lock bracket
- GAC innovation bracket
- Gestenco Oyster brackets
- Adenta evolution brackets
- Philippe lingual self-ligating brackets
- Opal brackets
- Smart clip brackets
- Forstadent quick bracket
- Lancer Praxis glide bracket
- Smart clarity SL bracket
- Vision LP brackets
- Discovery brackets
- Damon Q brackets

Clinical tips when using self- ligating brackets⁹

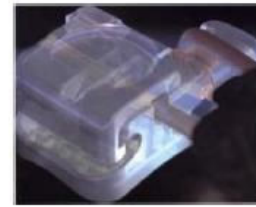
1. Aids in arch wire engagement
2. Wire can be held in place with different tools
3. Self-ligating brackets use pushing force rather than pulling force
4. In badly rotated tooth, first close the clip rather than thread the arch wire
5. Turn the ends of the wire securely to prevent wire pokes



Twinlock bracket



GAC innovation bracket



Gestenco Oyster brackets



Smart clarity SL brackets



Discovery brackets



Lancer praxis glide



Forstadent quick



Opal metal bracket



Smart clip bracket

Conclusion

Currently available self-ligating brackets offer a very valuable combination of extremely low friction and secure full bracket engagement. They are sufficiently robust and user friendly to deliver most of the potential advantages of this type of bracket. The core advantage of self-ligation is now established and readily available. These developments offer the significant reduction in average treatment times and may be also in anchorage requirements. Evidence of better treatment effectiveness exists, but is incomplete. While further refinements are desirable and further studies are essential, current brackets appear to be able to deliver measurable benefits.

References

1. Eliades T, Pandis N. Self-ligation in orthodontics. John Wiley & Sons; 2009 Nov 9.
2. Harradine NW. Self-ligating brackets and treatment efficiency. Clin Orthod Res. 2001 Nov;4(4):220-7.
3. Proffit WR, Fields Jr HW, Sarver DM. Contemporary Orthodontics. Elsevier Health Sciences; 2006 Dec 8.
4. Hanson GH. The SPEED system: a report on the development of a new edgewise appliance. Am J Orthod. 1980 Sep 1;78(3):243-65.

5. Read-Ward GE, Jones SP, Davies EH. A comparison of self-ligating and conventional orthodontic bracket systems. Br J Orthod. 1997 Nov 1;24(4):309-17.
6. Sims AP, Waters NE, Birnie DJ, Pethybridge RJ. A comparison of the forces required to produce tooth movement in vitro using two self-ligating brackets and a pre-adjusted bracket employing two types of ligation. Eur J Orthod. 1993 Oct 1;15(5):377-85.
7. Chen SS, Greenlee GM, Kim JE, Smith CL, Huang GJ. Systematic review of self-ligating brackets. Am J Orthod Dentofac Orthoped. 2010 Jun 1; 137(6):726-e1.
8. Rinchuse DJ, Miles PG. Self-ligating brackets: present and future. Am J Orthod Dentofac Orthoped. 2007 Aug 1;132(2):216-22.
9. Harradine NW. Self-ligating brackets: where are we now? J Orthod. 2003 Sep 1 30(3):262-73.

GLASS FIBRE POSTS IN DENTISTRY

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ABSTRACT

Teeth that have short clinical crown, which are not alone enough to support the definitive restoration can be best treated using the post and core system. The advantages of fiber post over conventional metallic post materials have led to its wide acceptance. In addition to that the combination of aesthetic and mechanical benefits of fiber post has provided it with a rise in the field of dentistry. Also the results obtained from some clinical trials have encouraged the clinicians to use the fiber posts confidently. Fiber posts are manufactured from pre-stretched fibers impregnated within a resin matrix. The fibers could that be of carbon, glass/silica, and quartz, whereas Epoxy and Bis-GMA are the most widely used resin bases. But recently studies are also found to be going on for polyimide as possible material for the fiber post resin base as a substitute for the conventional materials. This article presents a review of published literature examining fibre-based endodontic post systems.

Key words: fibre post, resin based, dentin

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Introduction

Teeth that have been endodontically treated often have little coronal tooth tissue remaining and as such require a post to retain the core and restoration.¹ Traditionally these posts have been cast or machined from metal and it is acknowledged that such posts weaken roots and lead to root fracture. In fact, prosthetic failure has been cited as the most common cause of failure in endodontically treated teeth.² Whilst placement of posts may contribute to this finding, cross-sectional surveys of failed posts^{3,4} have shown that most failures are because of post decementation. Other causes for post crown failure are caries and post fracture. Of greatest concern clinically is irreversible failure with root fracture necessitating extraction of the tooth.

In 1990, Duret et al.⁵ described a non-metallic material for the fabrication of posts based on the carbon-fibre reinforcement principle. Laboratory-based studies have shown that these posts have a high tensile strength⁶ and modulus of elasticity, similar to dentine.⁷

Previously, rigid metal posts resisted lateral forces without distortion and this resulted in stress transfer to the less rigid dentine causing potential root cracking and fracture. It is thought that fibre-posts flex under load and as a result distribute stresses between the post and the dentine. Currently available fibre-based posts are essentially composite materials. They are composed of fibres of carbon or silica surrounded by a matrix of polymer resin, usually an epoxy resin. A wide

variety of posts are available and include parallel-sided, tapered, smooth and serrated forms. Carbon-fibre posts are black in colour and do not lend themselves to aesthetic restorations with all-ceramic units. This led to the introduction of the silica-fibre posts which are translucent and more tooth coloured. These posts are also called glass-fibre and quartz-fibre. It has been suggested by manufacturers that these posts retain similar physical properties to carbon-fibre posts though there is little in the way of published evidence to demonstrate this.

History

History of fibre posts guides us to as far as 1989, when the producers claim to have introduced their original carbon fibre post-Composi post and they were started being used clinically, in France. However, the first evidence of a published article on the dental fibre posts was in 1990, by Duret et al.⁴

The initial fibre posts consisted of carbon/graphite fibres considering their good mechanical properties, such as high stiffness, tensile strength and conductivity to electricity and comparatively lower toxicity. The introduction of fibre posts brought an revolution in the field of dentistry, providing a reliable substitute to metal posts for the first time, of all types (casted or pre-fabricated). The material had modulus of elasticity much closer to dentin in contrast to that of the metallic posts and the clinical studies performed on fibre posts generated convincing outcomes. Over the time elapsed after the introduction of fibre posts, they have gained popularity in the dental market because of their benefits regarding ease in

manipulation, mechanical properties, esthetics and removability, offering predictable clinical performance in several ways. However, the initially introduced posts had some drawbacks regarding their esthetic usage, as they were radiolucent and difficult to conceal under all-ceramic or composite restorations. Especially in case of the anterior teeth, the color would reveal from an otherwise perfect definitive restoration. Successively, radiopaque fibre posts were obtained and more esthetic posts using the quartz and glass fibres were introduced to overcome this problem by being incorporated in the resin base. These fibre posts are white or translucent, more favourable for conditions with high esthetic demands. Besides, fibres have elasticity, high tensile strength, low electrical conductivity, resistance to solubility, and resistance to biochemical degradation. These quality claims highly advocated for the severe change for the acceptance of fibre posts.

Composition

Currently available fibre-based posts are essentially composite materials. They consist of pre stretched fibres of carbon or silica bounded by a matrix of polymer resin. Most of the fibre-reinforced posts contain epoxy resin or Bis-GMA matrix along with some fillers. Fibre-reinforced post systems contain a high volume percentage of continuous fibres embedded in polymer matrixes, which are commonly epoxy polymers with high degree of conversion and a highly cross-linked structure that binds the fibres. Carbon fibre posts are prepared from continuous and unidirectional carbon fibres in an epoxy resin

matrix. Drawback of carbon-fibre posts to provide desired esthetics with all-ceramic restorations resulted in the production of translucent and tooth colored silica-fibre posts. These are also called glass-fibre and quartz-fibre reinforced posts. Manufacturers suggest that these posts hold similar biomechanical properties as carbon-fibre posts, Glass fibre posts could contain different types of glass, such as E-glass (electrical glass), and S-glass (high-strength glass). Also, glass fibre posts could also be made from quartz fibre, which is pure silica in a crystallized form and provide better esthetic results.

Ideal requirements of a fibre post

Ideal properties for the post material include physical properties like modulus of elasticity, compressive strength, flexural strength and thermal expansion, compatible to that of dentin.

- It should esthetically resemble and bond efficiently to the dentine.
- Provide maximum retention with minimal removal of dentin
- Provide maximum retentiveness to the core
- Even distribution of functional stress along the root surface
- Resistance to displacement
- Esthetic compatibility with definitive restoration and surrounding tissue
- Easy retrievability, Ease of use
- Cost effective
- Safety and reliability

Metal posts with their stiff and hard nature; transfer the forces along their long axis creating a wedge effect on the tooth structure, acting similar to a metal wedge on a piece of wood. Fibre posts having similar modulus of elasticity as dentin, avoid this condition to a considerable extent. In case where the endodontic treatment has to be redone, fibre posts can be easily removed with little or no tooth removal, providing the dentist with options for further treatment.

Advantages

- Improved esthetics
- Improved adhesive property
- Post, core and cement are resin based and constitute a homogenous assembly
- More homogenous stress distribution
- Better biomechanical performance with greater fracture loads
- Favourable mode of failure allowing repair

Mechanical properties

Metal posts because of their rigidity usually had a higher strength than the fibre posts. But then the tendency to fracture was much higher wherein the fibre post, the failure mode normally is not root fracture. The flexural strength and modulus of elasticity of fibre posts were initially claimed to be closer to dentin. In fact the modulus of elasticity of fibre posts was lesser than that of dentin and hence they decreased the incidence of root fracture. When the fibre posts failed, they generally failed favourably and the teeth were restorable.⁸

Adhesion to intraradicular dentin

A basic prerequisite for adhesion of posts to the intra radicular dentin is represented by the ability of the clinician to achieve a clean post-space preparation for post placement. During root canal treatment, sodium hypochlorite, EDTA, gutta percha and sealers modify intra radicular dentin.⁹ As post space preparation extends deep into the root canal, the application of adhesive into the canal walls is not easier. Hence, for the dentin-post cement bond to be successful, several factors need to be considered which could possibly affect the intra-radicular dentin. These factors which need to be assessed include smear layer, post space preparation, irrigants and medicaments, eugenol and gutta-percha removal during retreatment.

The endodontic smear layer contains inorganic and organic substances and also includes microorganisms, necrotic material and odontoblastic process. This smear layer which is seen over the root dentinal surface is also packed into the dentinal tubules which could have a detrimental effect on the bonding. Hence, while using a bonding system in the radicular dentin the mechanism by which different bonding systems affect the smear layer should be clearly understood. Adhesive systems interact with dentin by either removing the smear layer like using etch and rinse technique or by modifying the smear layer when self-etch technique is followed. Although there is controversy as to retain or remove the smear layer in adhesive dentistry, it is considered to be advantageous to remove the smear layer in intraradicular dentin.

The endodontic smear layer could possibly be infected by microorganisms and allow intraradicular medicaments into the dentinal tubules. Apart from the smear layer that is produced during root canal procedures, post space preparation using drills could also produce smear layer which is rich in sealers and gutta-percha remnants and these could hinder the bonding of the resin cement if fibre posts are used. Various studies on pretreatment with chelating agents and sodium hypochlorite and EDTA with ultrasonics have also been suggested.¹⁰

Sodium hypochlorite is the common irrigant used in root canal treatment. Despite its positive effects on root canal walls during irrigation it leaves behind an oxygen rich layer on the walls of the dentin which could adversely affect the bond strength of resin cements.

Hence, reducing agents like 10% ascorbic acid can be used to intra radicular dentin after sodium hypochlorite application. This converts the intraradicular dentin surface from an oxidizing to a reducing surface and facilitates polymerization of resins. Use of Hydrogen peroxide and RC- prep during root canal treatment also has a detrimental effect on bonding and can be altered by the use of 10% ascorbic acid. Eugenol present in the root canal sealers and temporary restorative materials can permeate dentin and also inhibit the polymerization of resin based materials. This can be reversed by mechanical cleaning of the root canal walls by using alcohol to remove all residual layer. In such instances etch and rinse system is preferred to self etch

system, as the phosphoric acid pretreatment eliminates the contaminated smear layer and results in demineralization of dentin.¹¹

Cementation of posts to intraradicular dentin

Fibre posts are cemented to intraradicular dentin by using resin cement. For the bonding to be successful, the substrate should be clean of debris and the selection of resin cement should be assessed. As mentioned earlier, etch and rinse adhesives help in the removal of smear layer and hence when bonded with the dual cured resin cement, does increase the bond strength. Most clinicians prefer using dual cured resin adhesives for bonding to root canal dentin because of their ability to self polymerize in the absence of light in the deeper regions of post cavity. Light curing still remains mandatory to obtain complete adhesive polymerization. During polymerization process, shrinkage stresses are common and could decrease retention and increase leakage. Apart from polymerization shrinkage, other factors that could influence shrinkage stress and gap formation is the cavity configuration factor (C- factor), which is the ratio of the bonded to the unbonded surface areas of the restorations.¹² When the C-factor is higher, the shrinkage stress would exceed the bond strength of the bonding agents.

Considering the debonding failures seen due to the higher C-factors, another important issue to be assessed is the shape of the posts. The circular shape of the posts does not correspond to the shape of the canals. In addition the post diameter should also be taken into account, as the posts could fit perfectly at the apical end

while in the remainder of the canal the post is too thin compared to the canal wall and hence a thicker luting cement is required, which becomes the weakest part of the system under occlusal loading. Hence, for minimizing resin cement thickness, the use of anatomic posts, oval posts indirect luting procedures may be useful in clinical practice.

In the absence of clinical symptoms or a sinus tract, the post-endodontic restoration can be performed at the same visit as the root canal. In single rooted teeth, the fibre post with the core could strengthen the thin remaining root structure and prevent fracture of the remaining restoration. In multi rooted teeth, the posts are usually placed in the larger canals. Normally, the palatal and distal canals are preferred for the maxillary and mandibular molars respectively.

Light transmitting posts

Many posts available are claimed to be translucent, or in other words, permit light to pass through the post. As light cured resin cements are not indicated for luting fibre posts, the role of light can be important when dual cured resin cements are used. For any dual cured setting cement, the light should activate the setting reaction after which the reaction continues in self-cure mode. There are several post systems which claims that the light is transmitted through the translucent post which could cure both the resin cement and the bonding adhesives.

Superficial treatment of fibre posts

Since the introduction of fibre posts, there has been several efforts to improve bonding inside the root canals. Despite the development of

new adhesive systems, bonding inside the root canal still is unfavorable compared to coronal dentin.¹³ The most common adhesive failure is debonding at the resin cement-dentin interface.¹⁴ Immediately after fibre post cementation and core buildup, the restoration has to resist the stresses transmitted during the reduction of the core structure. At the coronal level, the amount of residual tooth structure remaining favours a strong adhesion and retention. At the post-core interfacial level, only the chemical interaction between the surface of post and the core material would ensure the bonding of the material around the post.

In an attempt to achieve good bonding of fibre posts to resin cements, several surface treatment of fibre posts have been recommended. Treating the posts with silane coupling agent may be advisable but then opinions differ on the efficiency of post silanization. Hydrofluoric acid has recently been recommended for etching fibre posts. Etching with hydrofluoric acid creates a roughened surface that allows for micromechanical interlocking with the resinous restoration. Another method of superficial treatment of posts is by means of sandblasting with alumina particles which results in increased roughness of the surface.

Removal of posts

Orthograde root canal retreatment requires the removal of the existing coronal restoration in order to obtain access to the root canal system and this may include the removal of the post.¹⁵ Several techniques can be used to remove posts and these include the use of ultrasonic vibration which is the most commonly preferred. A general consensus

among clinicians is that it is far easier to remove the fibre posts than the metal posts. Unlike cast posts or prefabricated posts, fibre posts are not retrieved in a single piece. Special drills are supplied by the manufacturers which help in removing the posts without the risk of perforation or removal of excess dentin.

Conclusion

Overall, it can be concluded from this review that the use of GFPs in clinical practice seems to be recommended to improve the retention of restorations and complete crowns in cases of great loss of tooth structure. However, in order to obtain the best results with GFP anchorage, clinicians should be aware of the difficulties in achieving good adhesion within the root canal. Clinicians should also pay attention to the selection of materials, and the manufacturers' recommendations should be thoroughly followed. More clinical research should be conducted to find out the influence of remaining tooth structure, i.e., the number of remaining walls, on the clinical performance of GFP-retained restorations. Also, state-of-the-art techniques, mainly concerning the use self-adhesive cements and silane for improving GFP retention to root canal, should be explored in future studies.

References

1. Guzy G E, Nicholls J I. In vitro comparison of intact endodontically treated teeth with and without endo-post reinforcement. J Prosthet Dent 1979; 42: 39-44.
2. Vire D E. Failure of endodontically treated teeth: classification and evaluation. J Endod 1991; 17: 338-42.

3. Lewis R, Smith B G. A clinical survey of failed post retained crowns. Br Dent J 1988. 165: 95-7.
4. Turner C H. Post-retained crown failure: a survey. Dent Update 1982; 9:221, 224-226, 228-9.
5. Duret B, Reynaud M, Duret F. [New concept of coronoradicular reconstruction: the Composipost (1)]. Chir Dent Fr 1990; 60:131-41.
6. King P A, Setchell D J. An in vitro evaluation of a prototype CFRC prefabricated post developed for the restoration of pulpless teeth. J Oral Rehabil 1990; 17: 599-609.
7. Asmussen E, Peutzfeldt A, Heitmann T. Stiffness, elastic limit, and strength of newer types of endodontic posts. J Dent 1999; 27: 275-8.
8. Lagouvardos, P., Sourai, P., Douvitsas, G. 1989. Coronal fractures in posterior teeth. Oper Dent., 14: 28-32.
9. Feilzer AJ, Dauvillier BS. Effect of TEGDMA/BISGMA ratio of stress development and visco elastic properties of experimental two paste systems. J Dent Res 2003; 824-8.
10. Pashley, D.H. 1992. Smear layer: an overview of structure and function. Proc Finn Dent Soc., 88215224.
11. Serafino, C., Gallina, G., Cumbo, E., Ferrari, M. 2004. Surface debris of canal walls after post space preparation in endodontically treated teeth: a scanning electron microscopic study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod., 97: 381387.
12. Standlee, J.P., Caputo, A. 1992. Endodontic dowel retention with resinous cement. J. Prosthet Dent., 68: 913-7.
13. Van Meerbeek, B., De Munck, J., Yoshida, Y., Inoue, S., Vargas, M. and Vijay, P. 2003. Adhesion to enamel and dentin: current status and future challenges. Oper Dent., 28:215-35.
14. William Cheung, 2005. A review of the management of endodontically treated teeth. Jr of Am Den Assoc, 136:611-9.
15. Woody, T.L., Davis, R.D. 1992. The effect of eugenol containing and eugenol free temporary cements on microleakage in resin bonded restorations. Oper Dent., 17:175-80.