A COMPARATIVE EVALUATION OF MARGINAL ADAPTABILITY OF THREE RECENT NANO-FILLED RESTORATIVE MATERIALS UNDER SCANNING ELECTRON MICROSCOPE (IN-VITRO STUDY)

Thesis submitted in partial fulfilment of the requirement for degree of

MASTER OF DENTAL SURGERY

In the subject of

CONSERVATIVE DENTISTRY AND ENDODONTICS

DEPARTMENT OF CONSERVATIVE DENTISTRY & ENDODONTICS

BABU BANARASI DAS COLLEGE OF DENTAL SCIENCES,

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DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled **"A COMPARATIVE EVALUATION OF MARGINAL ADAPTABILITY OF THREE RECENT NANO-FILLED RESTORATIVE MATERIAL UNDER SCANNING ELECTRON MICROSCOPE (IN-VITRO STUDY)"** is a bonafied and genuine research work carried out by me under the guidance of **Dr. LALIT *C.* Boruah**, Professor Department of Conservative Dentistry and Endodontics, Babu Banarasi Das College of Dental Sciences, Babu Banarasi Das University, Lucknow, Uttar Pradesh.

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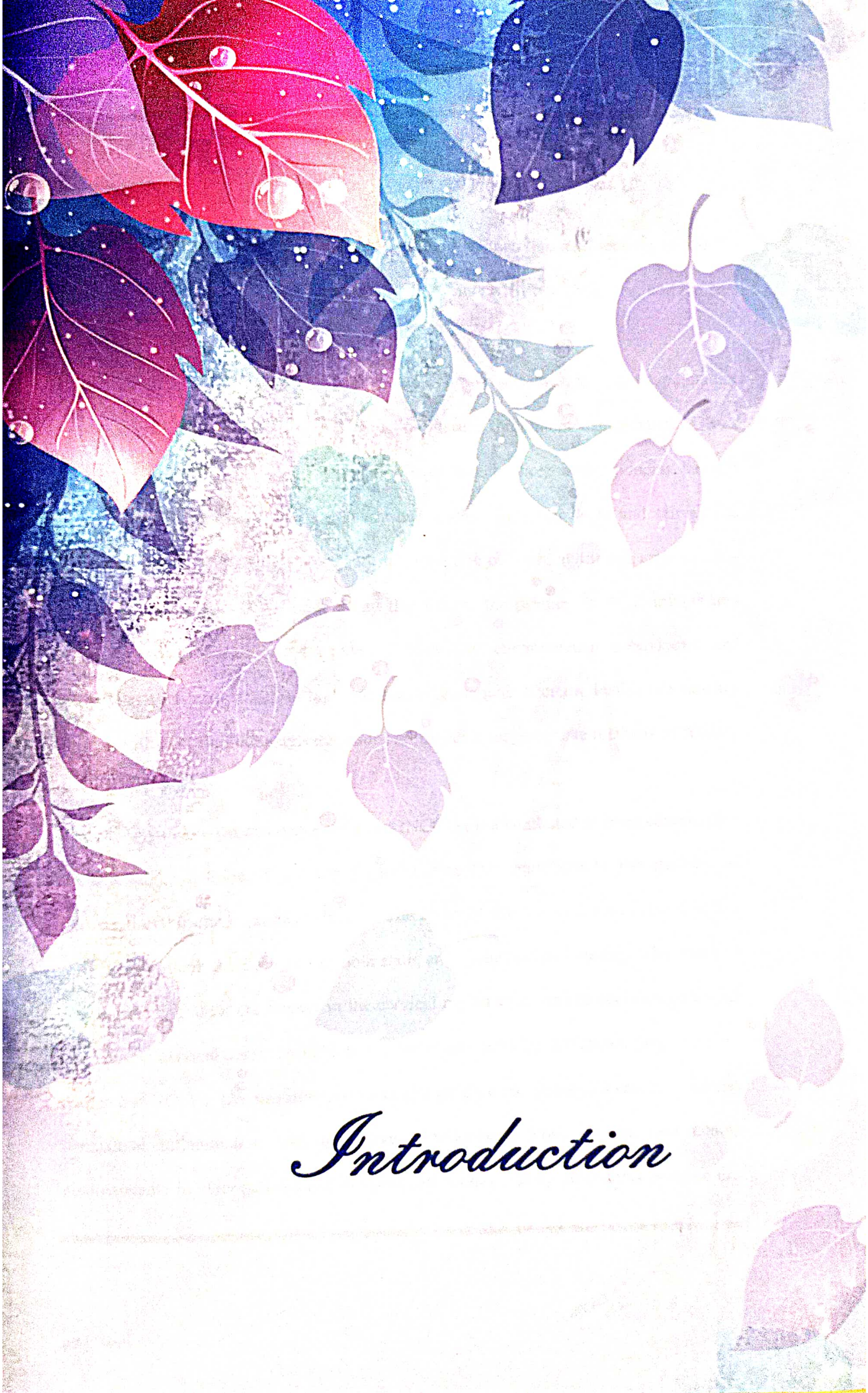


Introduction

INTRODUCTION

There have been rapid changes and developments in materials and techniques used in dentistry over the past decade than in the previous hundred years combined, and the pace is accelerating in every day.

Dental caries, is one of the most prevalent chronic diseases in human population worldwide, individuals are susceptible to this disease throughout their lifetime. Dental caries forms through a complex interaction over time between acid-producing bacteria and fermentable carbohydrate, and many host factors including teeth and saliva. The disease develops in both the crown and root structure of teeth, and it can arise in early childhood as an aggressive tooth decay that affects the primary teeth of infants and toddlers. Risk for caries includes physical, biological, environmental, behavioural, and lifestyle-related factors such as high numbers of cariogenic bacteria, inadequate salivary flow, insufficient fluoride exposure, poor oral hygiene, inappropriate methods of feeding infants, and poverty.

The etiology of non carious cervical lesions (NCCLs) is a combined or more commonly a multifactorial condition. There are 3 mechanisms that contribute to the etiology of NCCLs stress, friction and bio-corrosion. The effect of stress manifestiated as abfraction and occurs through the dynamics of both static and cyclic occlusal loading. The effect of occlusal loading are more intense in the cervical region where the stress is concentrated thus causing cervical dentin hypersentivity, cementum cracking, attachment loss, gingival ression and NCCLs. Degenerative processes and gingival recession, as a result of chronic periodontal inflammation and aggressive periodontal therapy, expose root dentin predominantly in older patients and inappropriate tooth brushing procedures promote the

development of saucer- or wedge-shaped lesions in the cervical area of the teeth. In such patients root caries develops rapidly.[97]

Studies have shown that mechanism of both static stress and fatigue (cyclic) stress bio corrosion increases hard tissue loss in area of stress concentration. The mechanical interlocking between enamel and dentin in the cervical region is weaker than in other regions of the dentinoenamel junction, resulting in a higher susceptibility to crack formation. This type of cervical defect has been characterized as abfraction. Sensitivity associated with deep or caries-affected class V defects need to be restored to stop further destruction of the tooth and to avoid the risk of pulp inflammation[38] **(Juergen Manhart et al. 2001).**

Despite the improvements of restorative material in recent decades, the marginal integrity of restorations remains a challenge for dentistry. Poor marginal adaptation may produce marginal discoloration, postoperative sensibility, and secondary caries. These are the most frequent reasons to replace or repair an adhesive restoration. The marginal failure of composite resin restorations is related mainly to the quality of bonding to the dental structures and to stress generated on the restoration.

In the age of esthetic dental adhesives, new materials and consequently, new techniques have been developed for tooth restoration, offering special handling characteristics and seeking to facilitate the daily practice of the clinician[16] **(Daniela Thomazatti et al. 2002).**

There has always been a keen interest in the adaptation of dental restorative materials to the walls of the cavity and the retentive ability of a material to seal the cavity against ingress of oral fluids and microorganisms [42]**(Mali P. et al. 2006).**

Microleakage around dental restorative materials is a major problem in clinical dentistry. It may be defined as the clinically undetectable passage of bacteria, fluids, molecules or ion between a cavity wall and the restorative materials applied to it. This seepage can cause hypersensitivity of restored teeth, tooth discoloration, recurrent caries, pulpal injury and accelerated deterioration of some restorative materials. [47]

Various restorative materials have been recommended for restoration Like Glass ionomer cement, resin modified GICs, composite and resin composite, flowable composite etc.

Cervical defects like minimally invasive restorative intervention, such as sealing or covering with composite resin material, could be the therapy of choice. It is evident from the recent literature that there is no place for metallic materials such as amalgam and gold in the modern day restoration of NCCLs. Glass ionomer cements (GICs), Resin-modified GICs (RMGICs), a GIC/RMGIC liner base laminated with a resin composite, and resin composite in combination with a dentine bonding agent are all restorative options.[97]

Resin composites were introduced as a restorative alternative to amalgam in mid 1960. In recent years many modifications have been incorporated to it to enhance its physical & chemical properties as well as its clinical handlings. All these technical advances lead to introduction of superior group of resin composites like nanocomposites

Nanocomposites are very promising new class of composites that exhibit adequate combination of chemical, physical and mechanical properties. Only small amounts of nanofiller are sufficient to raise the values of chemomechanical properties and clinical parameters .

Flowable composites are widely used in clinical practice and are the most common resin materials that are recommend for restoration of cervical lesions instead of conventional resin composites. These materials have good aesthetic properties, and because of low

viscosity, are easier to place and more self-adaptable compared to stiffer restorative materials. Also, flowable materials may act as a stress-breaker; therefore, they have also been advocated as a gingival liner in proximal surface composite resin restorations. The flowable composite resins due to their lower filler content have higher polymerization shrinkage. Stresses from shrinkage create forces that compete with the adhesive bond, and this may disrupt the bond to cavity walls, which is still one of the main causes of marginal failure and subsequent micro leakage. Whereas in cervical lesions, the lack of enamel at the gingival margin aggravates the situation. Thus, the importance of perfect seal for success and longevity of class V resin restorations must be considered at the time of restorative treatment. [57]

Complete penetration into the entire depth of the demineralized zone and obtaining a reliable bonding is essential to prevent bacterial microleakage and recurrent caries, although some researchers concluded that there was no difference in occlusal or cervical microleakage of cavities restored with flowable or hybrid composite resins.

Marginal adaptation is the degree of approximation or fit of filling material to the tooth surface. A close marginal adaptation and seal at the interface is important for successful dental restorations. To overcome the problem of adaptability issue of resin composites, flowable composites were introduced. Recently numerous flowable composites with variable filler sizes including nanofillers are available although their marginal adaptibilty is still a matter of debate.

Marginal gap measurement has been defined as vertical marginal discrepancy, horizontal marginal discrepancy, overextended margin, under extended margin, seating discrepancy and absolute marginal discrepancy. Even though in current available literature there is no standard method available for measuring the marginal fit. Scanning electron microscopy

Conclusion

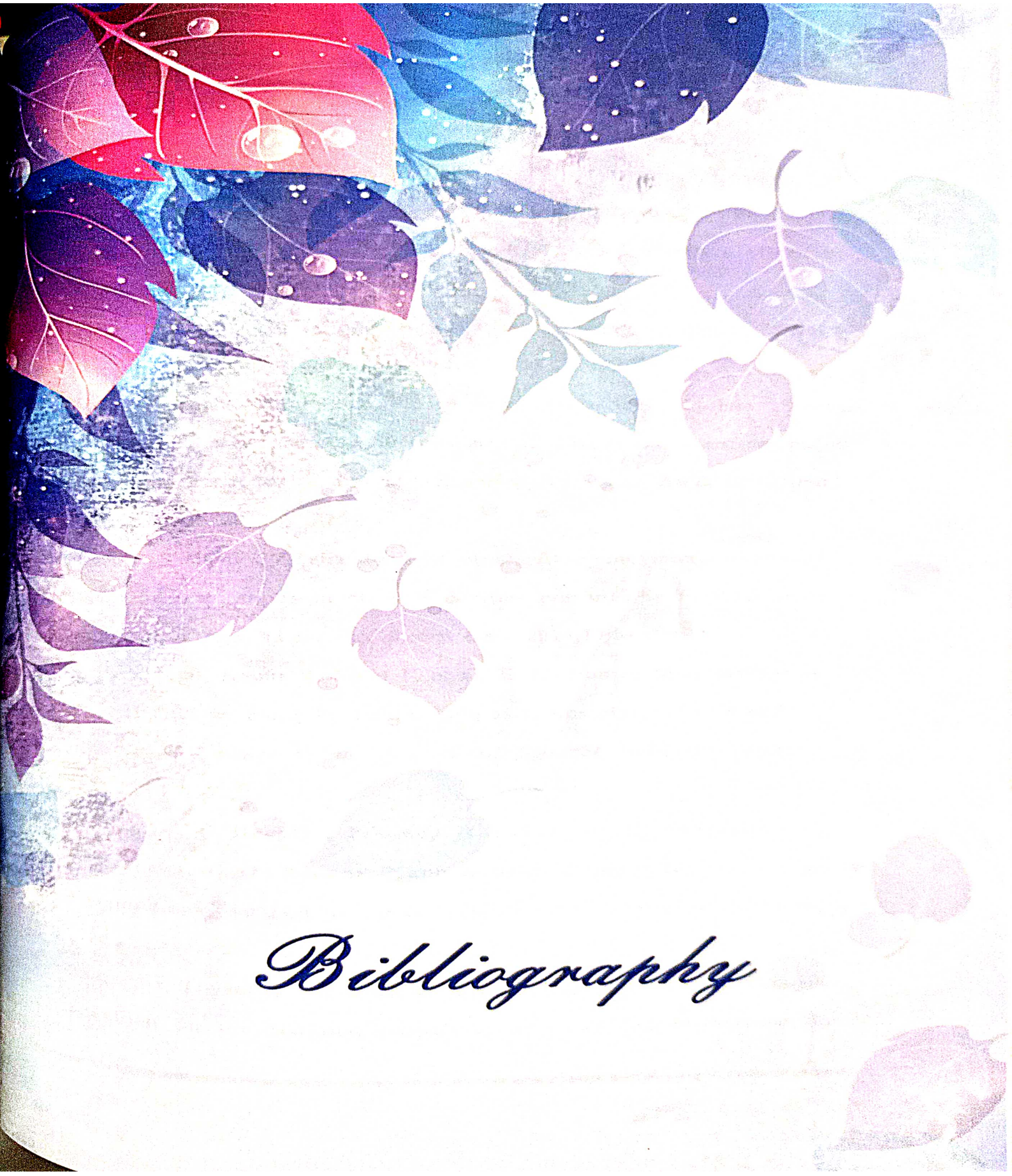
CONCLUSION

Within the limitations of the methodology used in present in vitro study "The marginal adaptability of three recent nano filled restorative materials under scanning electron microscope".it can be concluded that-

Marginal gaps were observed in all the three Groups (group 1, 2 and 3)

1. In Group 1 (brilliant flow) maximum marginal gaps were present (0.0- 7-8 µm).
2. In Group 2(beautifil injectable) marginal gaps were less then compared to the group 1 (0.0- 4.2 µm).
3. In Group 3(G-aenial flo) minimum marginal gaps were observed in comparison to other two groups (0.0- 2.3µm)

Considering the results and observations pertaining to marginal gaps in class V cavity were minimum when restored with flowable composite G-aenial flow, Gc.(Group-3) in the present study .Although further clinical and evidence based studies are necessary to reaffirm these finding in clinical situation.



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