

**An Invitro Comparative Study on Antibacterial Effect and  
Tensile Bond Strength of Self Etching Adhesive  
Resin with and without MDPB**

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## INTRODUCTION

Modern dental practice has an increasing demand for esthetic restorations that lead to the extensive use of adhesive dental materials. Many adhesive systems have been developed since BUONOCORE (1955) first described the acid etch technique on enamel. These techniques however, have not been successful in procedures involving dentin, where the fluid in the dentinal tubules wets the dentin surfaces and interferes with adhesion and subsequent bond strength. In addition, HEMBREE & ANDREWS (1978) have demonstrated that polymerization shrinkage of composite resin can cause significant microleakage on margins that do not involve enamel, which results in gaps in the tooth/restoration interface (MUNKSGAARD, HANSEN & ASMUSSEN 1984).<sup>46</sup>

To minimize the contraction gap formation and the potential for bacterial leakage, dentin adhesives have been developed. However, so far, no adhesive system has proven to be completely effective (BERGENHOLTZ-1982, LUNDIN, NOREN & WARFVINGE-1990, PRATI et al-1990, TJAN & TAN-1991). Even dentin adhesive systems which show high bond strengths in invitro studies have been reported to be incapable of preventing the occurrence of micro gaps between the tooth and the restoration<sup>28</sup> and bacteria invaded the cavity floor under these adhesive resin restorations as stated by KAKETA et al<sup>33</sup>.

A number of investigators (BRANNSTROM & VOJINOVIC-1976, PATERSON-1976) have implicated bacterial infiltration at such interfaces resulting in severe post operative complications such as sensitivity, recurrent caries, pulpal inflammation, leading to degradation and necrosis of the pulp. (BERGENHOLTZ & OTHERS-1982).

Thus, polymerization shrinkage and the resultant contraction gaps at the tooth restoration interfaces continue to be a significant problem associated with composite resin restorations. (ROULET & NOACK-1991)<sup>32</sup>. Further SEM studies have shown that microgaps existed at the resin dentin interface in human subjects when recent adhesive systems were used. Therefore, dentin bonding systems which possess high bond strength and antibacterial activity even after being placed in the cavity would be beneficial for eliminating the harmful effect caused by bacterial microleakage.<sup>28</sup>

Newer adhesive systems namely self etching primers combine both dentin conditioning and bonding in a single step and are considered to contribute to better clinical results by reducing the risk of conditioned surface being contaminated<sup>26</sup>. However, these systems modify and incorporate the bacteria containing smear layer into the hybrid layer which is a potential disadvantage of these systems.

The ongoing research in the field of adhesive technology has evolved newer adhesive systems to check the residual bacteria in the cavity and also reduce the micro/nano leakage with increasing bond strength. Thus the technology has come out with adhesive systems with antibacterial monomers incorporated into the dentin primers. Therefore, the possibility of self etching primers having anti bacterial effects is attractive.

In order to provide dental adhesive material with antibacterial activity, a new monomer 12-methacryloyloxy dodecyl pyridinium bromide (MDPB) has been added to the adhesive which is synthesized by combining the antibacterial agent- quaternary ammonium and a methacryloyl group.<sup>22</sup>

Adhesive systems should possess high tensile bond strengths to the dental hard tissues in order to resist the polymerization shrinkage that occurs

in the adhesive materials thereby avoiding gap formation and microleakage in the tooth/restoration interface.

The objective of this invitro study was to compare the antibacterial activity of a self etching primer incorporating the anti bacterial monomer MDPB with a conventional self etching primer without MDPB, and the effect of MDPB incorporation on the tensile bond strength of the adhesive system.

## **REVIEW OF LITERATURE**

In 1988, *BAPNA, MURPHY & MUKHERJEE*<sup>2</sup> studied the antibacterial activity of Scotch bond adhesive resin to which various chemical agents such as sodium fluoride, Dodecylamine, Copper oxide, Vanillic acid, Syringic acid, Protargin (a silver compound) and EDDA were added against Streptococcus mutans and concluded that Sodium fluoride and Dodecylamine resulted in large percentage decrease in S.mutans adhesion and growth, followed by Protargin which has a milder effect. Copper oxide and other chelating agents such as Vanillic acid, Syringic acid and EDDA had no antibacterial effect.

In 1988, *HOSHINO.E, KOTA.K, SATO.M & IWAKU.M*, clarified the invitro bactericidal efficacy of Metronidazole against bacteria of human carious dentin by measuring the difference between bacterial recovery from suspensions of carious dentin on metronidazole containing BHI-Blood agar plates and control plates and the difference in the bacterial recovery from carious lesions of freshly extracted teeth, covered by  $\alpha$ -tricalcium phosphate (TCP) cement containing metronidazole for 1-3 days and that covered by TCP only and inferred that bacteria were not recovered when samples were inoculated on metronidazole-containing BHI-Blood agar plates or when the

lesions were covered by TCP cement containing metronidazole, indicating that metronidazole effectively disinfected the carious dentin.<sup>12</sup>

In 1989, **HOSHINO.E, IWAKU.M, SATO.M, ANDO.N & KOTA.K**, evaluated the bactericidal efficacy of metronidazole applied topically to dentinal lesions in vivo, by measuring the bacterial recovery with or without application of metronidazole and concluded that no colony forming units were recovered from the samples of dentinal lesions covered with TCP & metronidazole thus indicating that metronidazole is a valuable material in caries treatment to disinfect carious dentin.<sup>13</sup>

In 1989, **FELTON, BERGENHOLTZ & COX**,<sup>9</sup> investigated the effects of a glutaraldehyde containing dentin bonding agent GLUMA, on bacterial colonization in experimentally infected dentin cavities restored with composite resin in adult monkeys and revealed that GLUMA had a distinct in vivo antibacterial effect that seems to prevent bacterial growth in tooth-restoration interface.

In 1989, **WARREN, SCHERER, NITA LIPPMAN & JAMES KAIM**<sup>46</sup> compared the anti microbial effect of several restorative materials including glass ionomer cements when they are exposed to four types of bacteria typically found in caries and plaque and concluded that

- ◆ Glass ionomer cement materials used as liners/bases and restorative materials produced zoned of inhibition with the four bacteria used in the study.
- ◆ Glass ionomer cement liner/base materials which contain zinc oxide produced zones of inhibition larger than did those not containing zinc oxide.
- ◆ Composite material *Flouever* is capable of producing zones of microbial inhibition.
- ◆ Dispersalloy amalgam produced zones of inhibition with all bacteria tested in the study.

In 1992, **BAPNA, MURPHY & MUKHERJEE**<sup>3</sup> investigated the antibacterial activity of Scotchbond dental adhesive resin in which 2,2'-bipyridine, an iron binding agent was incorporated against *S.mutans* and concluded that a large percentage decrease in *S.mutans* adhesion to the surface of resin as well as substantial inhibition of bacterial growth in the media resulted.

In 1993, **C.G.EMILSON & G.BERGENHOLTZ**<sup>8</sup> evaluated the susceptibility of five bacterial species to seven dentin bonding agents before and after curing in vitro and concluded that currently marketed composite resin systems vary greatly in their ability to act on growth of a variety of oral bacterial organisms in vitro.

In 1993, **C.PRATI, F.FAVA, D.DI GIOIA, M.SELIGHINI & D.H.PASHLEY**<sup>39</sup> examined the antibacterial activities of several commercially available glass ionomer cements, dentin bonding systems and luting agents by employing both agar plate diffusion and growth inhibition methods. Amalgam and resin composites were also tested as control materials. Four bacterial strains were tested: *Streptococcus mutans*, *Streptococcus salivarius*, *Streptococcus mitis* and *Streptococcus sanguis*. The results of their study were as follows: The glass ionomers showed marked antibacterial activity. On the contrary, amalgam, composites, luting agents and dentinal bonding systems did not affect bacterial growth.

In 1994, **S.IMAZATO, M.TORII, Y.TSUCHITANI, J.F.MC CABE & R.R.B.RUSSELL**<sup>17</sup> estimated the antibacterial activity of composites incorporating MDPB and measured the elution of the antibacterial components from the material and also the influence of incorporation of the new monomer on the mechanical properties of the material. The results were as follows:

- ◆ Uncured MDPB revealed antibacterial activity against *S.mutans* and six other species of oral streptococci with the minimum inhibitory concentration for *S.mutans* being comparable with that of triclosan.
- ◆ After curing, no elution of the antibacterial components was observed from the material.
- ◆ Incorporation of MDPB had no significant influence on the mechanical properties of the composite.

In 1994, *S.IMAZATO & J.F.MC CABE*<sup>18</sup> evaluated the influence of incorporation of MDPB on the curing behavior of Bis-GMA based composites by comparing their depth of cure, degree of conversion, light attenuation and surface hardness with those for a control material containing no MDPB. They concluded that the depth of cure and degree of conversion was greater for MDPB containing composites than controls, light attenuating capacity was less for MDPB containing composites than the control and no significant difference in surface hardness was found between MDPB containing composites and control.

In 1994, *M.F.BURROW, J.TAGAMI, T.NEGISHI, T.NIKAIDO & H.HOSODA*<sup>4</sup> evaluated the tensile bond strength immediately after curing of five established enamel and dentin bonding systems and two experimental systems to bovine enamel and dentin as a substitute for human teeth and concluded that bond strengths at the early stages were always less than the 24 hour results.

In 1996, *RICARDO CARVALJAES FRAGA, JOSE FREITAS SIQUEIRA & MILTON DE UZEDA*,<sup>10</sup> tested the inhibitory effects of two dentin bonding systems on bacterial growth, one with fluoride and the other with glutaraldehyde and two light cure glass ionomer cements that are frequently used as liners, by agar diffusion test and concluded that no effect

was shown by dentin bonding system with fluoride in its composition, a significant inhibition occurred when dentin bonding system that contained glutaraldehyde was tested. Both the light cure glass ionomer cements were effective against all bacterial strains except *Lactobacillus casei* and *Streptococcus sobrinus*.

In 1997, **SATOSHI IMAZATO, Y.KINOMOTO, H.TARUMI, M.TORII, R.R.B. RUSSELL & J.F.MC CABE**<sup>19</sup> investigated the antibacterial activity of a dentin primer incorporating a polymerizable antibacterial monomer 12-methacryloyloxy dodecyl pyridinium bromide (MDPB), before being cured and also the influence of incorporation of MDPB on tensile bond strength to dentin and on the curing behavior of the adhesive system and concluded that the incorporation of anti bacterial monomer MDPB enhanced the antibacterial effect of a proprietary dentin primer before curing and has no adverse influence on the bond strength to dentin and curing of the adhesive system.

In 1998, **S.IMAZATO, A.EHARA, M.TORII & S.EBISU**<sup>20</sup> investigated the inhibitory effect of MDPB containing dentin primer on oral bacteria after curing and concluded that incorporation of antibacterial monomer MDPB into dentin primer is beneficial for providing antibacterial activity even after curing.

In 1998, **S.IMAZATO, S.IMAI, R.R.RUSSELL, TORII.M & EBISU.S**<sup>21</sup> investigated the effect of incorporation of antibacterial monomer MDPB and adhesion promoting phosphoric monomer 10-MDP into BisGMA based dental resin and its antibacterial activity after curing and concluded that bactericide immobilized in BisGMA based resin demonstrated bacteriostatic activity as a contact antimicrobial even when adhesion promoting phosphoric monomer was incorporated into the materials.

In 1999, *S.IMAZATO, NOBOU EBI, H.TARUMI, ROY R.B.RUSSELL, T.KANEKO & S.EBISU*<sup>22</sup> investigated the bactericidal characteristics and cytotoxicity of a newly developed anti bacterial monomer 12-MDPB and demonstrated that MDPB has a strong bactericidal activity against oral streptococci and rapidly kills bacterial cells at a concentration of 4 times of minimal bactericidal concentration or more and cytotoxic effects of MDPB were considered to be similar to those of the other monomers routinely used for dental resin based materials.

In 1999, *HERRERA, A.CASTILLO, P.BACA & P.CARRION*<sup>14</sup> examined the invitro antibacterial activity of glass ionomer restorative cements Ketac fil, Ketac silver, Fuji II LC and Vitremer in conjunction with a total of 32 strains of five bacterial genera that may be associated with dental caries, Streptococcus species, Lactobacillus species, Actinomyces species, Porphyromonas species and Clostridium species, by agar diffusion test and concluded that Vitremer was the cement determined to have the greatest anti bacterial effect whereas Ketac silver presented the least inhibitory action.

In 1999, *OHMORI.K, MAEDA.N & KOHNO.A*<sup>37</sup> compared the antibacterial activities of three dentin primers namely SA primer in Clearfill Liner bond, LB primer in Clearfill Liner bond II and ED primer in Panavia 21 and investigated a newly designed experimental system using a bovine tooth model method for evaluating antibacterial activity by comparing this method with a conventional disc diffusion method and concluded that ED primer showed the widest inhibition zone in the disc diffusion test, which was significantly different from the other primers. Using the bovine tooth model, all dentin primers showed antibacterial activity, with significant differences found among them. The results indicated that ED primer had the strongest antibacterial effect among the three primers.

In 1999, *S.IMAZATO, H.TARUMI, S.KATO & S.EBISU*<sup>23</sup> investigated the influence of incorporation of MDPB on water sorption and color stability of Bis-GMA based composites and inferred that incorporation of small amounts of antibacterial monomer MDPB showed no influence on the water sorption characteristics and affected a little the color stability of Bis-GMA based composites causing rapid discoloration.

In 1999, *H.SANO, M.OSHIKAWA, P.N.R.PEREIRA, N.KANEMURA, M.MORIGAMI, J.TAGAMI & D.H.PASHLEY*<sup>41</sup> assessed the long term durability of dentin bond made with a self etching primer in the oral environment of a monkey under occlusal stress and inferred that bond strength measurements were stable at approximately 19 MPa during 1 year testing.

In 2000, *EHARA.A, M.TORII, S.IMAZATO & S.EBISU*,<sup>7</sup> investigated the antibacterial activity and release kinetics of an experimental resin system which was prepared by addition of a methacrylic acid as a cation exchanger and a cationic antibacterial agent Cetyl pyridinium chloride (CPC) to TEGDMA and demonstrated that the resin system was able to desorb and re adsorb the cationic bactericide by an ion exchange mechanism and could show an inhibitory effect on *S.mutans* growth and plaque formation.

In 2000, *S.IMAZATO, H.TARUMI, N.EBI & S.EBISU*<sup>24</sup> investigated the cytotoxic effects of composites which employ proprietary self etching primers or experimental primers containing an anti bacterial monomer MDPB on human pulp cells by in vitro dentin barrier tests and demonstrated that composites which employ self etching primers produced mild cytotoxic effects on human pulp cells in vitro. Incorporation of MDPB into a proprietary primer up to 5% had no significant influence on the cytotoxicity observed.

In 2000, *HERRERA.M, CARION.P, BRAVO.M & CASTILLO.A*<sup>15</sup> evaluated the antibacterial action of four bonding systems and concluded that all the adhesives were found to inhibit bacterial growth but with difference in their spectrum of action.

In 2000, *Y.KUDOU, K.OBARA, T.KAWASHIMA*<sup>33</sup> investigated the influence of addition of antibacterial agents Vancomycin and Metronidazole to the PMMA powder of 4-META/MMA-TBB resin system on the tensile bond strength to dentin and the antibacterial effect and showed that it was possible to produce a bonding system with both antibacterial effect and high tensile bond strength by addition of Vancomycin to PMMA powder.

In 2000, *BUNO T.ROSA & JORGE PERDIGAO*,<sup>40</sup> in their study on “Bond strength of non rinsing adhesives” tested two null hypotheses

1. The use of a self etch adhesive (Prompt-L-Pop) and a non rinsing conditioner with a one bottle adhesive (NRC & Prime & Bond NT) would not result in bond strengths different from those obtained with conventional phosphoric acid etching.
2. The type of restorative material (compomer versus resin composite) would not influence shear bond strengths.

In their results the first null hypothesis was rejected. Bond strengths obtained after conventional etching were statistically different for most groups either higher or lower. Their study failed to reject the second null hypothesis: the type of the restorative material did not influence shear bond strengths.

In 2000, *YOSHIYAMA.M, URAYAMA.A, KIMOCHI.T, MATSUO.T & PASHLEY.D.H*<sup>48</sup> compared the interfacial morphology and micro-tensile bond strengths of a self-etching bonding system (Fluorobond) to that of a conventional bonding system (Single Bond) to caries-affected versus normal dentin and concluded that bonding to normal dentin with the two bonding systems showed tensile bond strengths significantly higher than

those to caries affected dentin. The moist bonding technique significantly increased bond strength of Single Bond to normal and caries affected dentin. SEM examination revealed that typical hybrid layer and resin tags could not be formed to caries affected dentin due to the prevention of resin penetration by occlusion of dentinal tubules by mineral deposits that may also impart acid resistance to the intertubular matrix of caries affected dentin.

In 2001, *S.IMAZATO, Y.TORII, T.TAKATSUKA*<sup>25</sup> investigated the bactericidal effect of a dentin primer incorporating the antibacterial monomer 12-MDPB against bacteria in human carious dentin and demonstrated that the experimental primer containing MDPB was able to kill the bacteria even when diluted 40 times and thus could be beneficial for eliminating the residual bacteria in cavities.

In 2001, *ATILA STEPHAN ATAC, ZAFER.C.CEHRELI, BURCIN SENER*<sup>1</sup> compared the antibacterial activity of three fifth generation dentin bonding systems namely Single bond, Prime & Bond NT and Excite using a disc diffusion method and inferred that current single bottle dentin adhesives are capable of producing anti bacterial effects to varying degrees.

In 2001, *A.KARANIKAKOUMA, P.DIONYSOPOULOS, E.KOLINIOTOU-KOUBIA & A.KOLOKOTRONIS*<sup>32</sup> examined the antibacterial activities of bonding systems Syntac, EBS & Scotchbond I, Polyacid modified composite resins, Hytac & Compoglass and the composite resins, Tetric, Z100 and Scalp-it against cariogenic bacteria *Streptococcus mutans*, *Lactobacillus salivarius*, *Streptococcus sobrinus* and *Actinomyces viscosus* in vitro with a modified cylinder drop plate agar diffusion assay and concluded that all adhesives of the dentin bonding systems and polyacid modified composites exhibited various degrees of anti bacterial activity against all of the test bacteria. On the contrary, composite resins did not affect bacterial growth.

In 2001, *NOBORU EBI, S.IMAZATO, YUICHIRO NOIRI & SHIGEYUKI EBISU*,<sup>6</sup> determined the inhibitory effects of resin composites containing bactericide-immobilized filler on plaque accumulation and indicated that the experimental composite had reproducible inhibitory effects against plaque accumulation compared with control although it showed no elution of unpolymerized MDPB.

In 2002, *S.IMAZATO, A. KURAMOTO, T.KANEKO, S.EBISU & ROY R.B.RUSSELL* <sup>26</sup> assessed the intrinsic antibacterial activity of commercially available simplified adhesive systems by agar disc diffusion method and concluded that antibacterial activity of simplified adhesives varies greatly among commercial brands but none of the products examined had antibacterial effects comparable to the experimental primer containing chlorhexidine.

In 2002, *S.IMAZATO, ANGUS W.G.WALLS, A.KURAMOTO & S.EBISU*,<sup>27</sup> evaluated the ability of proprietary dentin bonding systems and experimental dentin bonding system containing MDPB to penetrate into extensively demineralized artificial carious lesions and the bactericidal effects of experimental system against bacteria in demineralized dentin using a model system and concluded that penetration of dentin bonding system in extensively demineralized root dentin is possible in vitro and the experimental dentin bonding system containing antibacterial monomer MDPB is capable of killing bacteria within the demineralized dentin.

In 2002, *M.YOSHIYAMA, F.R.TAY, J.DOI, Y.NISHITANI, T.YAMADA, K.ITOU, R.M.CARVALHO, M.NAKAJIMA AND D.H.PASHLEY* <sup>47</sup> measured the micro tensile bond strength of a total etch adhesive and an experimental self etch adhesive to caries infected dentin, caries affected and sound dentin and correlated those results with ultrastructural observations. The bond strengths of both adhesives to sound

dentin were significantly higher than those to caries affected dentin, which in turn were significantly higher than those to caries infected dentin. For both adhesives hybrid layers in caries affected dentin were thicker but more porous than those in sound dentin.

In 2002, **KARLHEINZ MOLL, HYUN JUNG, PARK & BERND HALLER**<sup>36</sup> compared the bonding potential to human dentin of adhesive/composite combinations including five two step and two three step total etch bonding systems, two systems with self conditioning primers and one self conditioning all in one adhesive by use of the micro tensile bond test and concluded that use of adhesive/composite combinations including simplified bonding systems does not necessarily result in reduced bond strength to dentin. Self conditioning primer offer a promising alternative to phosphoric acid etching as far as bonding to dentin is concerned. In contrast, self conditioning all in one adhesive evaluated needs to be improved.

In 2002, **GABRIELA IBARRA, MARCOS A.VARGAS, STEVE R. ARMSTRONG, DEBORAH S. COBB**<sup>16</sup> assessed the micro tensile bond strength of two self etching primers to ground and unground enamel and concluded that bond strength values of the two self etching adhesive systems tested were similar to the conventional one and surface preparation of enamel had no influence on the bond strength of either of the products tested.

In 2003, **Z.H.CEHRELI, A.S.ATAC & B.SENER**<sup>5</sup> compared the antibacterial activity of five self etching primer systems against a single bottle Total etch bonding agent using a disc diffusion method and concluded that contemporary self etching adhesive systems are capable of producing antibacterial effects to varying degrees in vitro.

In 2003, *S.IMAZATO, Y.KINOMOTO, H.TARUMI, S.EBISU & FRANKLIN R.TAY*<sup>28</sup> investigated the antibacterial activity of an adhesive resin incorporating the antibacterial monomer 12-MDPB as well as bonding characteristics in terms of bond strength into dentin and curing ability and demonstrated that an adhesive resin with antibacterial activity after curing could be produced by incorporation of MDPB without influencing the bond strength or curing performance.

In 2003, *IMAZATO.S, EBI.N, Y.TAKAHASHI, T.KANEKO, S.EBISU & R.R.RUSSELL*<sup>29</sup> examined the antibacterial ability of prepolymerized resin filler in which the bactericide quaternary ammonium was immobilized against *S.mutans* and demonstrated that the bactericide immobilized filler containing MDPB shows significant bacteriostatic effects without releasing antibacterial components and is useful for incorporation into various resin based restoratives.

In 2003, *JORGE PERDIGAO & SAULO GERALDELI*<sup>38</sup> tested the null hypothesis that the preparation of enamel surface would not affect the enamel micro tensile bond strength of self etch adhesive materials and concluded that commercial self etch adhesives performed better on prepared enamel than on unprepared enamel.

In 2003, *SATOSHI IMAZATO*<sup>30</sup> reviewed the antibacterial properties of resin composites and dentin bonding systems and has stated that with regard to composites; commercially available products including fluoride releasing materials have no antibacterial effect after being cured, which may explain why composites accumulate more plaque than other filling materials. Antibacterial composites can be classified into two groups based on the release profile of antibacterial components as agent-releasing and non-agent-releasing materials. Among the proprietary dentin bonding systems, the products which contain glutaraldehyde or have an acidic

property exhibit some antibacterial effects. However, the antibacterial properties shown by these products are only side effects which are derived from the constituents included to produce superior bonding characteristics and appear to be unreliable. It is worthy of continuing the attempts to develop DBS which can inhibit invading bacteria after the placement of the restoration as well as residual bacteria in the cavity.

In 2004, *G.SCHMATZ, Z.ERGUCU & K-A HILLER*<sup>42</sup> examined the antibacterial effect of different dentin bonding systems and two components of dentin adhesives (2 HEMA) & TEGDMA against cariogenic bacteria with and without dentin of various thicknesses being placed between the test material and bacteria and concluded that antibacterial activities associated with some dentin bonding systems and chlorhexidine are modified by the presence of dentin.

In 2004, *S.IMAZATO, T.KANEKO, Y.TAKAHASHI, Y.NOIRI & S.EBISU*<sup>31</sup> evaluated the in vivo antibacterial effects of dentin primer incorporating MDPB against *Streptococcus mutans* by determining the number of bacteria recovered after application of the primer solution to cavities in dog teeth infected with *Streptococcus mutans*. They also restored the infected cavities with the primer and examined the pulp response histopathologically after 7, 30 and 75 days. They proposed that the experimental primer resulted in little or no pulpal inflammation and concluded that the experimental primer containing MDPB could exhibit in vivo antibacterial effects.

In 2004, *G.C.LOPES, F.C.MARSON, L.C.C.VIEIRA, M.A.C.DE ANDRADA & L.N.BARATIERI*<sup>34</sup> compared the shear bond strength to enamel of five self etching primer/adhesive systems and one total-etch one bottle adhesive system and concluded that shear bond strength to enamel with self etching primer/adhesive systems may depend on specific

composition and Clearfill SE bond was the only self etching system that achieved a composite to enamel bond strength similar to a total etch system.

In 2004, *SHLOMO MATALON, HAGAY SLUTZKY & ERVIN.I.WEISS*<sup>35</sup> tested the composite-bacteria interaction of fresh and aged samples of six packable composites using the direct contact test and Agar diffusion test and concluded that packable composite materials revealed no antibacterial properties and further, freshly polymerized composites supported bacterial growth.

In 2004, *HAGAY SLUTZKY, SHLOMO MATALON & ERVIN.I.WEISS*<sup>43</sup> evaluated the antibacterial properties of six single-bottle, polymerized bonding agents (fifth generation) using both the direct contact test and agar diffusion test and concluded that one-bottle bonding agents possess short term invitro antibacterial properties which was demonstrated only by the direct contact test.

## **SUMMARY**

This study was done to compare the antibacterial activity of a self etching primer containing antibacterial monomer MDPB (ABF) with a conventional self etching primer without MDPB (CLEARFIL SE BOND) against *Streptococcus mutans* and the effect of incorporation of MDPB on the tensile bond strength of the experimental self etching primer (ABF).

Antibacterial activity of the self etching primers were assessed using Agar disc diffusion method and the diameters of the zones of inhibition were measured and ranked. Further, the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of both the self etching primers were assessed using the macro broth dilution method.

For tensile bond strength testing, 20 non carious human molars were selected and randomly divided into two groups comprising of 10 teeth in each group. The teeth were prepared for tensile bond strength testing.

Group I specimens were treated with Clearfil SE bond (without MDPB)

Group II specimens were treated with ABF (with MDPB).

In both the groups, the corresponding primers were applied for 20 seconds, air dried for 5 seconds and the corresponding adhesives were applied and light cured for 20 seconds. Composite material was placed incrementally and cured for 40 seconds in all the specimens.

Tensile bond strength was estimated using the Instron Universal testing machine at a cross head speed of 1 mm/min. The results of the tensile bond strength tests were subjected to statistical analysis using Mann Whitney U test.

## **CONCLUSION**

From the results of the present study, it may be concluded that

1. Addition of MDPB into a self etching primer exerts potential antibacterial effect against *Streptococcus mutans*.
2. The zone of inhibition against *Streptococcus mutans* was maximum for MDPB containing primer when compared with the conventional self etching primer and the positive controls.
3. The results of the study further revealed that MDPB containing self etching primer retained its antibacterial effect even after 40 times dilution as against the conventional self etching primer without MDPB which lost its antibacterial effect after 20 times dilution.
4. The results of the tensile bond strength tests revealed that the tensile bond strength of the MDPB containing self etching primer was slightly lower than that of the conventional self etching primer but the difference was not statistically significant.

Thus a self etching primer containing MDPB will be a boon to adhesive dentistry as it ensures adequate tensile bond strength with the added advantage of being bactericidal before curing. Modern concept in caries management focuses on minimal removal of tooth structure, where cavities are restored with an attempt to leave carious dentin in which some active bacteria may survive. The self etching primer containing MDPB will be of immense value in improving the prognosis of such treatment with less surgical intervention. The expanded scope of special primers to impart bactericidal effect even after being cured will be an asset to adhesive dentistry.

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