FACULTY OF DENTISTRY
UNIVERSITAS TRISAKTI

FOKUS 2013

DENTAL COURSE FORUM

International Seminar and Dental Expo

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PROSIDING

ENHANCES SKILL AND SCIENCE TO BE A PROFESSIONAL AND ETHICAL DENTIST

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DAFTAR ISI

SAMBUTAN

Assalamualaikum Wr. Wb.

Salam Sejahtera untuk semua rekan Sejawat,

Salam dari Kampus FKG Usakti!

Atas ijin Allah swt/ Tuhan YME Fakultas Kedokteran Gigi, Universitas Trisakti dengan bangga tahun 2013 menyelenggarakan FOKUS (Forum Kursus Dental) yang akan diselenggarakan pada tanggal 10-12 Oktober 2013 di Balai Kartini, Jakarta.

Sebuah kegembiraan dan merupakan tanggung jawab bagi suatu lembaga pendidikan untuk terus mengembangkan ilmu pengetahuan serta mutu pelayanan demi memenuhi tuntutan serta kebutuhan masyarakat dalam mencari perawatan gigi dan rongga mulut yang baik. Oleh karena itu sebagai salah satu tanggung jawab institusi pendidikan yaitu selalu melakukan pelatihan secara kontinyu dan berkesinambungan demi melayani serta meningkatkan kepercayaan masyarakat serta kemampuan memberikan pelayanan sesuai dengan tuntutan serta kebutuhan masyarakat yang semakin meningkat. Menyelenggarakan pelatihan-pelatihan, kegiatan ilmiah penyegaran dan peningkatan ilmu serta keterampilan adalah jawaban dari tanggung jawab bagi institusi pendidikan. Sementara sebagai abdi/ pelayan masyarakat juga harus selalu mengembangkan diri dengan selalu mengikuti pelatihan serta seminar dalam kaitan peningkatkan pengetahuan dan keterampilan.

Belajar seumur hidup, bukan hanya slogan tetapi harus perwujudan dan dilaksanakan dengan baik.

Melalui kegiatan FOKUS adalah salah satu jawaban untuk memenuhi kebutuhan ini. Semoga, apa yang disajikan pada FOKUS di bulan Oktober 2013 benar-benar dapat menjawab kebutuhan dalam memberikan pelayanan kepada masyarakat.

Salam sukses untuk semua peserta Fokus 2013.

Sampai jumpa pada kegiatan ilmiah FKG Usakti selanjutnya

Salam Hangat,

Prof. DR. Melanie S. Djamil, drg. M.Biomed.

Dekan Fakultas Kedokteran Gigi Universitas Trisakti

PENGANTAR

Assalamualaikum Wr. Wb.

Salam sejahtera untuk rekan Sejawat,

Puji dan syukur kami panjatkan kehadirat Tuhan Yang Maha Esa sehingga Fakultas Kedokteran Gigi Universitas Trisakti di Tahun 2013 ini berkesempatan untuk mengadakan kembali seminar ilmiah dan latihan ketrampilan yang dikenal sebagai FOKUS (Forum Kursus) 2013. FOKUS 2013 bertujuan untuk menambah wawasan dan pembelajaran terhadap ilmu maupun ketrampilan yang baru sehingga diharapkan dapat meningkatkan profesionalisme seorang dokter gigi. Hal ini tercermin dari tema FOKUS 2013 yaitu: "Meningkatkan ilmu dan ketrampilan agar dapat menjadi seorang dokter gigi yang profesional dan beretika".

Guna memperoleh media pembelajaran yang dapat dibaca kembali pasca Forum tersebut, maka kami menerbitkan prosiding yang berisi kumpulan artikel ilmiah dari berbagai pembicara dalam FOKUS 2013. Akhir kata, semoga buku ini berguna bagi teman sejawat sekalian. Selamat membaca.

Hormat Saya,

drg. Eko Fibryanto, SpKG

Ketua FOKUS 2013

SHEAR BOND STRENGTH DIFFERENCE OF SIX METAL ORTHODONTIC (PERBEDAAN KUAT REKAT GESER ENAM MEREK BREKET METAL ORTODONTI)

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ABSTRAK

Latar belakang: Peningkatan kebutuhan dalam perawatan ortodonti menyebabkan semakin banyak produsen dari beberapa negara maju baru memproduksi alat dan bahan ortodonti yang dijual bebas dan dipasarkan dengan harga ekonomis. **Tujuan:** Penelitian ini bertujuan untuk membandingkan kuat rekat geser breket metal ortodonti **Metode:** Penelitian ini menggunakan enam merek breket metal ortodonti dengan dasar *retention groove* yang memiliki unsur karbon, oksigen, silika, kromium, besi pada dasar breket. Breket-breket tersebut diuji *Energy Dispersive X-Ray Spectroscopy* untuk melihat unsurnya dan *Scanning Electron Microscope* untuk melihat gambaran dasar breket. Keenam merek breket tersebut dilekatkan pada enam puluh premolar pertama rahang atas yang dipilih secara acak. Masing-masing kelompok terdiri dari sepuluh premolar pertama rahang atas. Keenam kelompok tersebut kemudian dilakukan uji kuat rekat geser dan ditentukan skor ARI. **Hasil:** Analisis statistik *ANOVA* satu jalan terhadap rata-rata kuat rekat geser setiap kelompok breket menunjukkan bahwa tidak ada perbedaan bermakna ($p>0,05$) diantara keenam merek breket. Hasil uji korelasi *Pearson* untuk mengetahui adanya hubungan unsur breket, luas permukaan dengan kuat rekat geser menunjukkan tidak ada korelasi yang bermakna ($p>0,05$). Hasil uji korelasi *Spearman* untuk mengetahui hubungan jumlah bahan adhesif yang tertinggal pada permukaan email dengan kuat rekat geser juga menunjukkan tidak ada korelasi yang bermakna ($p>0,05$). **Kesimpulan:** Semua breket yang diteliti memenuhi standar kuat rekat geser untuk perawatan ortodonti. Tidak ada hubungan antara unsur breket dengan kuat rekat geser dan tidak ada hubungan luas permukaan dasar breket dengan kuat rekat gesernya.

Kata kunci: kuat rekat geser, breket metal ortodonti

BACKGROUND

Failure of bonding bracket is a problem in orthodontic treatment. Failure of bonding bracket might ended with patient's and doctor's disappointment. Factors that affect the bond strength between bracket and enamel surface are bracket base retention mechanism, adhesive material or bonding resin, and tooth surface preparation. [1-2]

The adhesion of metal brackets is obtained by mechanic interlock between base-adhesive resin-enamel. Various chemical and mechanical retentive designs have been suggested to enhance the retention of the adhesive to the metal base of orthodontic brackets.[3-4]

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Orthodontic brackets should also have minimum Adhesive Remnant Index (ARI) besides having a strong adhesion to the email. Adhesive Remnant Index is an index to evaluate the amount of adhesive which left on the enamel surface after debonding and to establish the sites of adhesive fracture. The enlargement of surface area of bracket can increase the brackets adhesion, but it causes enamel fracture.[3]

Base retentive system is one of the factors that influences the shear bond strength of metal brackets. Furthermore, cleaning and conditioning procedures of the enamel and adhesive systems can influence the retention of metal brackets.[4-5] Various studies have suggested 6 to 10 MPa as adequate bond strengths in clinics.[6]

Nowadays, many patients visit dental clinic for orthodontic treatment. They come to fixed their teeth or just want to have orthodontic treatment because of trend. Since increased demand for orthodontic treatment, new developed country such as Brazil, Rusia, India, and China produced material to fulfill it. They sell their product cheaper than other manufacturers to attract customer. Bracket has difference shear bond strength due to different bracket elements and base surfaces area.

OBJECTIVES

The purpose of this study was to find out shear bond strength difference of each brackets with different bracket price and element. The brackets used in this study are made of stainless steel and have retention groove bases.

MATERIAL AND METHOD

In these study, six brackets from different manufacturers, countries and prices were used. All brackets had base with retention groove. Each group consists of 10 upper first premolars. Six groups were distinguished based on its bracket, Shanghai (I), Smile (II), Ortho Classic (III), Orthox (IV), Class One (V), Comfort (VI). Those brackets were tested using EDS (Energy Dispersive X-Ray Spectroscopy) to evaluate brackets elements and SEM (Scanning Electron Microscope) to analyze the pattern brackets bases which affect the shear bond strength.

One hundred maxillary premolars extracted for orthodontic reasons were used in this study. The inclusion criteria of first premolar are no crack on the buccal side, no caries, no restoration and no decalsification. One hundred upper first premolars with inclusion criteria choosen to be sixty upper first premolar by random sampling and block randomization to determine the treatment. A prophylactic treatment was performed with pumice-powder paste-water containing natrium phosphate (Radent), rinsed with an air-water syringe for 10 seconds, and dried with an air-water syringe. Enamel was etched for 15 seconds with a 37% phosphoric acid (3M), rinsed with water, dried with an air-water syringe then bonding was applied. Bracket with small layer of light cured adhesive (Heliosit) were positioned and pressed on the buccal surfaces of the teeth. Excess adhesive was removed, then mesial and distal side of the tooth were light-cured for 10 second. Each tooth was then embedded in mould made of pipe 4 cm x 2,5 cm with self-curing acrylic resin, leaving the labial enamel exposed and positioned parallel to the universal testing machine.

The specimens were tested using universal testing machine (Instron, Shimadzu, AG5000E) with a crosshead speed of 1 mm/min and a 490 N load cell. A blade was placed at the bracket base-enamel interface at the occlusal side to test the shear brackets failure. The failure force was recorded in Newtons and converted into Megapascals by dividing the measured force values by the mean surface area of the brackets.

ARI was used to evaluate the amount of adhesive left on the enamel surface after debonding and to establish the adhesive fracture site. Brackets were observed with a magnifying glass and the remaining adhesive was scored with respect to the amount of resin material remaining on the enamel: score 0, less than 10% of the adhesive remained on the enamel; score 1, more than 10% but less than 50% of the adhesive

remained on the enamel; score 2, more than 50% but less than 90% of the adhesive remained on the enamel; score 3, more than 90% of the adhesive remained on the enamel with a clear impression of the bracket base on the adhesive enamel surface.

One way ANOVA was used to analyze the shear bond strength average among six brands metal orthodontic brackets. Kruskal-Wallis analysis was used to determine the amount of remaining adhesive material at the enamel surface. Pearson correlation was used to determine the correlation between bracket element and bracket surface area with shear bond strength. Spearman correlation test was used to determine the correlation between the amount of left adhesive on the enamel surface with shear bond strength.

RESULT

Laboratory test EDS showed that all brackets have carbon, oxygen, silica, chromium, and ferum in its base. Only group I has phosphate. Group III and V do not have nickel. Group III and V have sulphur and cuprum. Group IV and V have aluminium.(Table 1). All brackets were tested with SEM with 50x magnifying to analyze brackets surface area and were measured using caliper (tetragonal mesh and retention groove). (Figure 2 and Table 2). Surface area of brackets also measured with the caliper. Surface area of group I is 11,776 mm^2, group II is 9,472 mm^2, group III is 12,303 mm^2, Group IV is 11,418 mm^2, Group V is 12,648 mm^2 and Group VI is 9,235 mm^2.

Result of the shear bond strength in a range of 6,21 ± 1,49 MPa (group I) to 10,80 ± 6,99 MPa (group V). (Figure 3). One-way ANOVA test showed that there were statistically no significant differences among the six groups with respect to shear bond strength ($p > 0.05$).

Kruskal-Wallis analysis was used to determine the amount of remaining adhesive material at the enamel surface which was stated as ARI (Adhesive Remnant Index). The result of Kruskal-Wallis showed a significant difference in each group with a value of $p=0.014$ ($p<0.05$), $X^2=14.284$. In this study, the fracture majority occurred were mixture of cohesive and adhesive fracture.

The Pearson correlation test used to determine the correlation between bracket element and bracket surface area with shear bond strength. The result of Pearson correlation test shows that there is no significant correlation ($p>0.05$). Same test showed there is no correlation between bracket surface area and their bond strength ($p>0.05$).

The Spearman correlation test used to determine the correlation amount of adhesive left on the enamel surface with shear bond strength. The result Spearman correlation test also showed no significant correlation ($p>0.05$).

DISCUSSION

A dentist does orthodontic treatment to improve the teeth position by wire and brackets. Brackets must strongly attached to the surface of enamel tooth and have to easily removed without cause any damage to the enamel surface after orthodontic treatment. Failure of bonding bracket might cause a longer treatment time and uncomfortable for patient.

Based on EDS laboratory test, all bracket base contains carbon, oxygen, silica, chromium, and ferum. Chromium can increase its corrosion-resistant properties.[7,9] Chromium is added to nickel-based alloys to improve their ability to form a protective oxide film on their surface.[8] All group contains nickel alloy except group III and V. May be this group want to avoid allergic reaction in patients who are frequently caused by nickel. This group contains cuprum alloy can increase the hardness brackets.[10]

[5] Various studies have suggested 6 to 10 MPa as adequate bond strengths in clinics.[6] Therefore, all groups of brackets in this study have adequate shear bond strength as orthodontic brackets.

The Pearson correlation test showed that no significant correlation between brackets surface area and shear bond strength. Wang et al.(2004)[5] found the different result in their study is caused by circular concave bracket surface area.

One way ANOVA showed there was no significant difference ($p>0.05$) among the shear bond strength of six groups of metal orthodontic brackets. This study also supported by MacColl et al (1998)[11] that there were no statistically significant differences in shear bond strength among brackets with 12.35 mm^2 until 6.82 mm^2 surface area.

Pearson correlation test showed that there is a positive tendency correlation between carbon, oxygen and shear bond strength. The correlation between silica, chromium, ferum and shear bond strength shows negative tendency. Both of this correlation were no statistically significant ($p>0.05$).

Spearman correlation test which determined the correlation amount of adhesive left on the enamel surface with shear bond strength also showed no significant correlation ($p>0.05$). Hobson et al.(2002)[12] found the same result that there was no correlation between amount of adhesive left on the enamel surface and shear bond strength.

Kruskal-Wallis test for amount of adhesive left on the enamel surface showed a significant difference in each group ($p <0.05$). In this study, the majority of fracture were mixture of cohesive and adhesive fracture.

The type of enamel can affect the shear bond strength of bracket, but this issue was not examine in this study. In Further studies, we need to analyze the other bracket element that may affect the shear bond strength. Other research on other bracket brands will give more information for bracket with the highest shear bond strength.

CONCLUSIONS

It can be concluded that all brackets in this study have a standard of shear bond strength for orthodontic treatment while there is no correlation between element of bracket and surface area and their shear bond strength.

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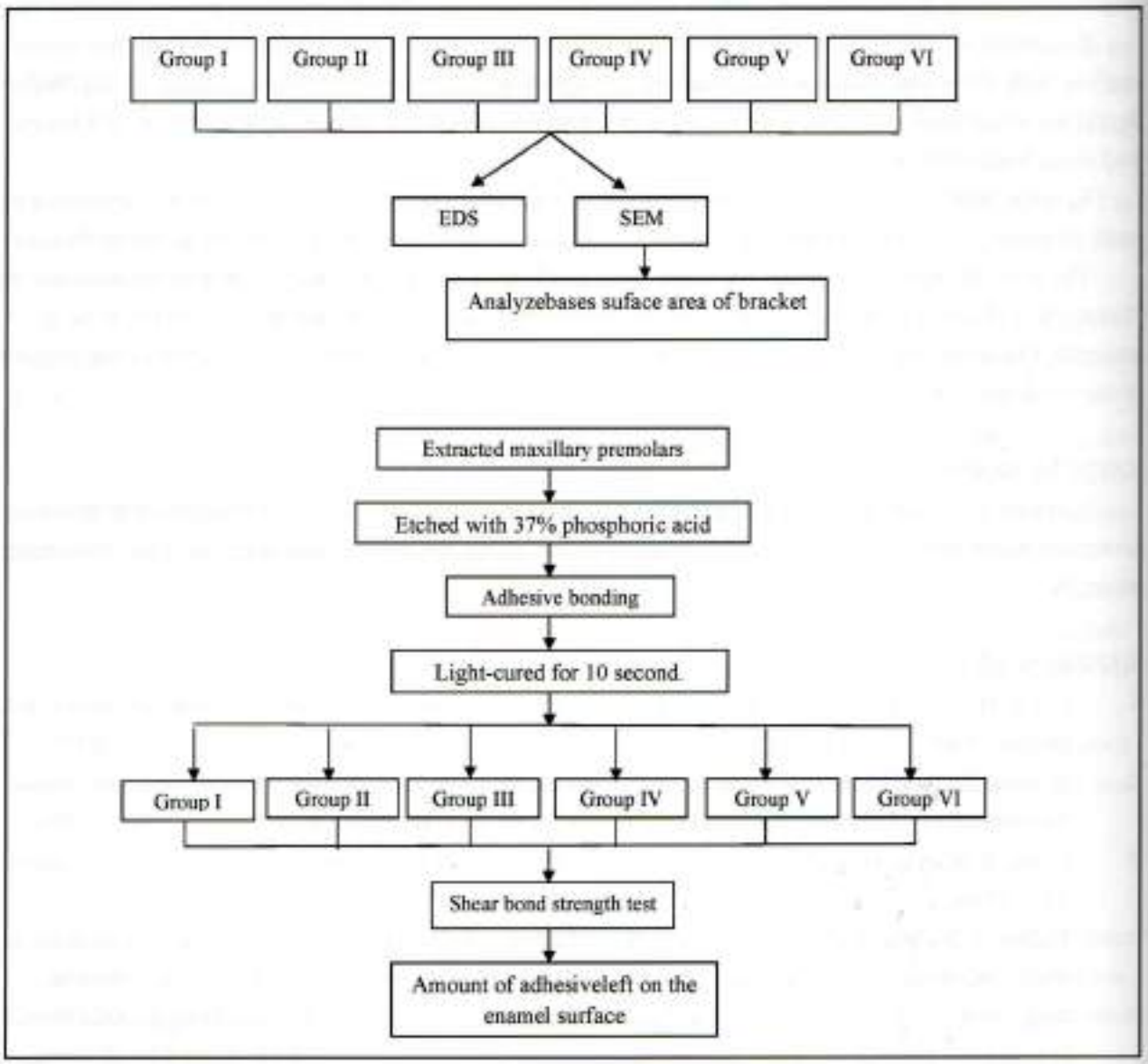

Figure 1. Work diagram of shear bond strength test

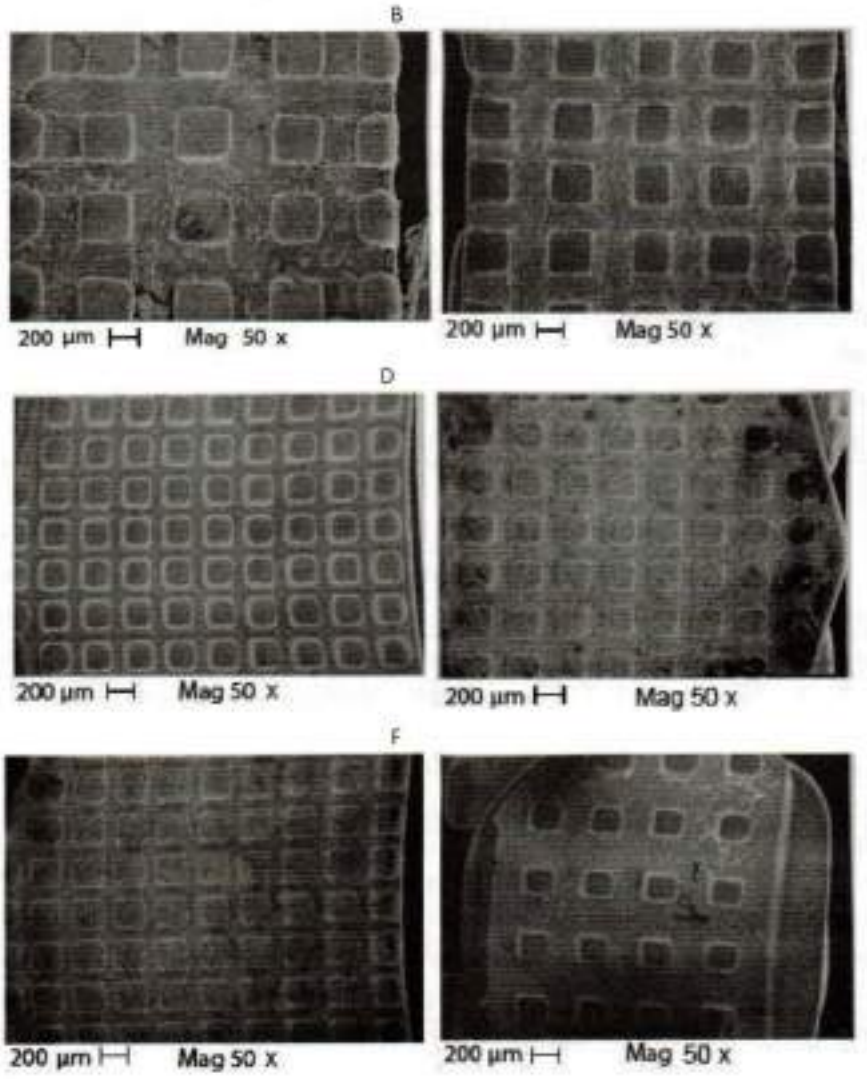

Figure 2. A. SEM of group I; B. SEM of group II; C. SEM of group III; D. SEM of group IV; E. SEM of group V; F. SEM of group VI

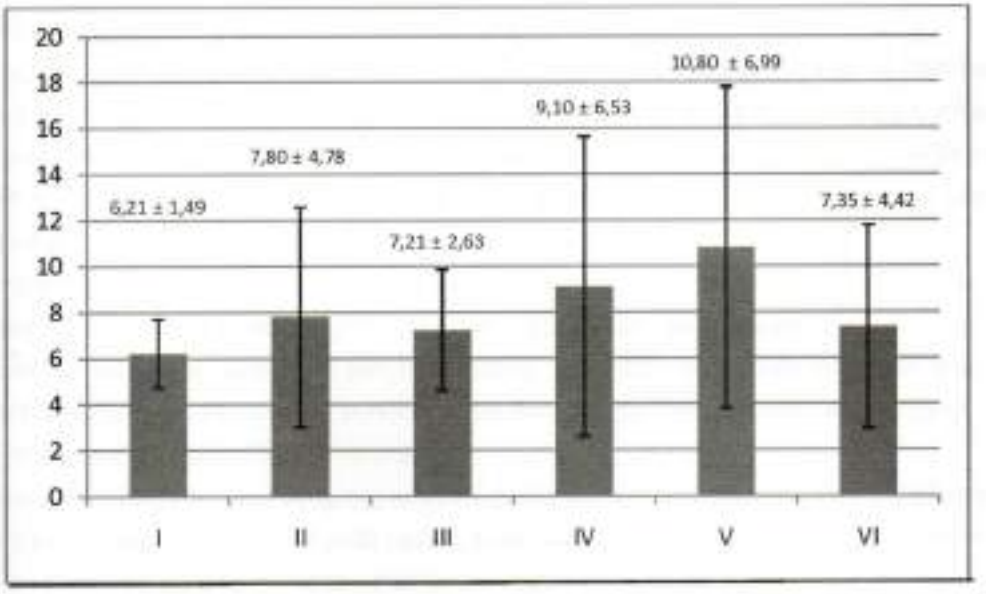

Figure 3. The result of the shear bond strength between six group metal orthodontic

Table1. Laboratory test EDS (Energy Dispersive X-Ray Spectroscopy) to analyze the elements of the brackets

Group	C (%)	O (%)	Si (%)	P (%)	Cr (%)	Fe (%)	Ni (%)	S (%)	Cu (%)	Al (%)
I	0,55	9,88	2,25	1,66	15,53	54,78	15,34			
II	0,51	5,11	1,05		17,29	65,67	10,52			
III	1,47	4,61	2,15		18,72	56,62		1,41	15,02	
IV	1,44	6,84	1,52		15,23	56,73	7,79			10,25
V	1,42	18,56	1,06		10,29	30,22		0,73	7,81	29,92
VI	0,34	5,10	4,23		16,19	68,56	8,76			

Tablel 2. Laboratory test SEM (Scanning Electron Microscope) to analyze tetragonal mesh and retention groove of brackets surface area

Group	Bracket Surface Area
I	400 x 360 µm and 300 x 260 µm
II	200 x 340 µm and 400 x 200 µm
III	200 x 200 µm and 120 x 1 20 µm
IV	220 x 220 µm and 100 x 100 µm
V	220 x 220 µm and 20 x 20 µm
VI	220 x 200 µm and 200 x 300 µm

drg. Rotalina T, MS, Ph.D.

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Kepada : Panitia Forum Kursus Dental Fakultas Kedokteran Gigi Universitas Trisakti dengan susunan personalia seperti daftar terlampir.

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Pada tanggal: 18 Februari 2013
D e k a n,

Prof. Dr. drg. Melanie S. Djamil, M.Biomed

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Shear Bond Strengtht Difference Of Six Metal Orthodontic (Perbedaan Kuat Rekat Geser Enam Merek Breket Metal Orthodonti)

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