

**PENINGKATAN JUMLAH SERAT KOLAGEN LIGAMEN PERIODONTAL,
KETEBALAN *INSERTING PERIODONTAL LIGAMENT FIBRE BUNDLES*
DAN KETEBALAN PRESEMENTUM PADA DAERAH TEKANAN
SEMENTUM GIGI AKIBAT PEMAKAIAN PIRANTI ORTODONSI CEKAT**

RINGKASAN

Pemakaian piranti ortodonsi cekat pada gigi mempunyai prinsip memberikan tekanan yang terus-menerus sampai terjadi pergerakan gigi. Tekanan yang diberikan pada gigi menyebabkan adanya daerah tekanan dan daerah tarikan pada gigi dengan perubahan aktivitas selular dan matriks ekstraselular.

Sementum merupakan salah satu jaringan gigi yang responsif terhadap kekuatan piranti ortodonsi. Sementum mempunyai fungsi yaitu memberikan perlekatan terhadap serat kolagen dari ligamen periodontal, menjaga integritas akar gigi, membantu menjaga posisi gigi fungsional dalam mulut dan terlibat dalam perbaikan dan regenerasi gigi sehingga proses pergerakan gigi karena piranti ortodonsi cekat dapat menyebabkan perubahan aktivitas selular dan matriks ekstraselular pada sementum gigi.

Penelitian eksperimental laboratories ini bertujuan untuk membuktikan perubahan jumlah serat kolagen ligamen periodontal, ketebalan *inserting periodontal ligament fibre bundles*, dan ketebalan presementum pada sementum terhadap pemakaian piranti ortodonsi cekat.

Penelitian ini dilakukan di Bagian Ortodonsia Departemen Gigi dan Mulut Rumah Sakit Dr Ramelan Surabaya dengan sampel pasien yang menjalani perawatan dengan piranti ortodonsi cekat. K adalah kelompok kontrol tanpa perlakuan sedangkan P adalah kelompok perlakuan dengan menggunakan piranti ortodonsi cekat dengan perlekatan braket pada gigi premolar pertama dilakukan tarikan oleh kawat busur labial logam Nitinol 0,012 inchi ke arah bukal selama 10 hari. Setelah 10 hari dilakukan pencabutan pada kedua gigi premolar pertama. Gigi disimpan dalam larutan *buffer formaline* 10 %. Kemudian gigi dikirim ke Laboratorium Patologi Anatomi Rumah Sakit Dr Soetomo untuk diproses menjadi sediaan. Sediaan dilihat pada mikroskop cahaya pada pembesaran 400 X dan dilakukan foto jaringan dengan kamera digital pada Laboratorium Anatomi Histologi Fakultas Kedokteran Universitas Airlangga. Dilakukan pemeriksaan jumlah serat kolagen ligamen periodontal, ketebalan *inserting periodontal ligament fibre bundle*, ketebalan presementum pada daerah tekanan sementum gigi premolar pertama menggunakan program *image tool*. Data yang diperoleh dianalisis dengan statistik deskriptif, MANOVA dan uji diskriminan.

Hasil penelitian menunjukkan bahwa pemakaian piranti ortodonsi cekat dapat meningkatkan jumlah serat ligament periodontal pada kelompok perlakuan $24,3636 \pm 2,3779$ jumlah serat per lapang pandang dibandingkan pada kelompok kontrol $20,8182 \pm 3,7635$ jumlah

serat per lapang pandang; ketebalan *inserting periodontal ligament fibre bundle* pada kelompok perlakuan $8,9773 \pm 1,4380$ mikron dibandingkan pada kelompok kontrol $6,0418 \pm 1,0746$ mikron, dan ketebalan presementum pada pada kelompok perlakuan $30,4673 \pm 11,3103$ mikron dibandingkan kelompok kontrol $26,3991 \pm 11,4540$ mikron dan berdasarkan uji MANOVA didapatkan hasil bahwa terdapat perbedaan yang bermakna ($p < 0,05$) pada jumlah serat ligament periodontal dan ketebalan *inserting periodontal ligament fibre bundle*. Kemudian analisis dilanjutkan dengan uji diskriminan untuk mengetahui variabel apa yang paling berperan memberikan kemaknaan ternyata adalah ketebalan *inserting periodontal ligament fibre bundle* yang merupakan variabel pembeda yang dominan.

Berdasarkan data yang diperoleh dari hasil penelitian ini menunjukkan bahwa pemakaian piranti ortodonsi cekat dapat meningkatkan jumlah serat kolagen ligamen periodontal, ketebalan *inserting periodontal ligament fibre bundle* dan ketebalan presementum pada pemakaian di daerah tekanan sementum gigi .Pada pemakaian piranti ortodonsi cekat di daerah tekanan sementum gigi terdapat perbedaan yang bermakna pada jumlah serat kolagen ligamen periodontal dan ketebalan *inserting periodontal ligament fibre bundles*. Ketebalan *inserting periodontal ligament fibre bundle* mempunyai kontribusi terbesar sebagai variabel pembeda yang paling dominan pada perubahan di daerah tekanan sementum gigi akibat pemakaian piranti ortodonsi cekat



SUMMARY

INCREASING AMOUNT OF PERIODONTAL LIGAMENT COLLAGEN FIBRE, THICKNESS OF INSERTING PERIODONTAL LIGAMENT FIBRE BUNDLES AND THICKNESS OF PRECEMENTUM AT PRESSURE SITE OF CEMENTUM AS A RESPONSE TO FIXED ORTHODONTIC APPLIANCE

Previous research has indicated that there are several reaction in cellular activity and extracellular matrix as a response after orthodontic force application. Cementum has function to give attachment to collagen fibres of the periodontal ligament, maintaining the integrity of the root, helping to maintain the tooth in its functional position in the mouth, and being involved in tooth repair and regeneration so in the orthodontic tooth movement can induce changes in the cementum.

The aim of this research is to investigate that fixed orthodontic appliance could increase the amount of periodontal ligament collagen fibre, thickness of inserting periodontal ligament fibre bundles and thickness of precementum at pressure site of cementum. This experimental study was held in laboratory with post test only control group design. Twenty two (22) premolar sample from 11 patient were divided into 2 groups. K group as control group (without treatment) and P group as treatment group (with using fixed orthodontic appliance).

The amount of periodontal ligament collagen fibre, thickness of inserting periodontal ligament fibre bundles and thickness of precementum were examined by light microscopy and measured by image tool program. All of datas in this study were analyzed by MANOVA and discriminant test. MANOVA test showed significantly difference ($p < 0,05$) for amount of periodontal ligament collagen fibre and thickness of inserting periodontal ligament fibre bundles, but not significant for thickness of the precementum. The amount of periodontal ligament collagen fibre increased ($24,3636 \pm 2,3779$ per square), the thickness of inserting periodontal ligament fibre bundles increased ($8,9773 \pm 1,4380$ micron) and thickness of precementum increased ($30,4673 \pm 11,3103$ micron). The highest dominant discriminant is determine by discriminant test and showed that thickness of inserting periodontal ligament fibre bundles is the highest dominant discriminant. This study suggested that fixed orthodontic appliance at the pressure site of cementum could increase the amount of periodontal ligament collagen fibre and thickness of inserting periodontal ligament fibre bundles significantly and the highest dominant dicriminant was thickness of inserting periodontal ligament fibre bundles.

ABSTRACT

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Orthodontic force application can induce cellular activity and extracellular matrix. Cementum has function to give attachment to collagen fibres of the periodontal ligament, maintaining the integrity of the root, helping to maintain the tooth in its functional position in the mouth, and being involved in tooth repair and regeneration so in the orthodontic tooth movement can induce changes in the cementum.

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Conclusion: The fixed orthodontic appliance at the pressure site of cementum could increase the amount of periodontal ligament collagen fibre and thickness of inserting periodontal ligament fibre bundles significantly and the highest dominant dicriminant was thickness of inserting periodontal ligament fibre bundles.

Key Words : Orthodontic Appliance, Cementum, Periodontal Ligament Collagen Fibre, Inserting Periodontal Ligament Fibre Bundles, Preceementum.