Clinical Evaluation of Laser Microtexturing for Soft Tissue and Bone Attachment to Dental Implants

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tanium alloy dental implants have been designed, fabricated, and tested with microgeometries (surface characteristics in the micron range) to control bone and soft-tissue integration. These surfaces have highly oriented, consistent microstructures that are applied using computer-controlled laser ablation techniques using a pulsed, computer-controlled Excimer laser system and large-area masking. Animal experiments indicate that this technology enhances bone and soft-tissue integration and controls the local microstructural geometry of attached bone.

Colonies of cells grown on the laser machined surfaces show preferential colonization parallel to the grooves. The microgrooved surfaces cause elongated colony growth, which is accelerated in the x direction (parallel to the surface microgeometry) and inhibited in the y direction (perpendicular to the surface microgeometry). On an individual cell level, the cells are observed to attach and orient along the surface grooves. This causes the cells to be “channeled” in the x direction, as compared with control cultures, where the outgrowing cells move randomly on flat surfaces. Cells are observed to attach and orient within the grooves and on flat tops of the grooves. This results in enhanced x axis growth and almost no y axis growth by cells on these surfaces; the cells are spindle shaped and well oriented.

Introduction: A tapered dental implant (Laser-Lok [LL] surface treatment) with a 2 mm wide collar, that has been laser micromachined in the lower 1.5 mm to preferentially accomplish bone and connective tissue attachment while inhibiting epithelial downgrowth, was evaluated in a prospective, controlled, multicenter clinical trial.

Materials: Data are reported at measurement periods from 1 to 37 months postoperative for 20 pairs of implants in 15 patients. The implants are placed adjacent to machined collar control implants of the same design. Measurement values are reported for bleeding index, plaque index, probing depth, and crestal bone loss.

Results: No statistical differences are measured for either bleeding or plaque index. At all measurement periods there are significant differences in the probing depths and the crestal bone loss differences are significant after 7 months (P < 0.001). At 37 months the mean probing depth is 2.30 mm and the mean crestal bone loss is 0.59 mm for LL versus 3.60 and 1.94 mm, respectively, for control implant. Also, comparing results in the mandible versus those in the maxilla demonstrates a bigger difference (control implant — LL) in the mean in crestal bone loss and probing depth in the maxilla. However, this result was not statistically significant.

Discussion: The consistent difference in probing depth between LL and control implant demonstrates the formation of a stable soft-tissue seal above the crestal bone. LL limited the crestal bone loss to the 0.59 mm range as opposed to the 1.94 mm crestal bone loss reported for control implant. The LL implant was found to be comparable with the control implant in safety endpoints plaque index and sulcular bleeding index. There is a non-statistically significant suggestion that the LL crestal bone retention superiority is greater in the maxilla than the mandible. (Implant Dent 2009;18:1–)

Key Words: alveolar bone loss/etiology, dental prosthesis design, crestal bone, implant surface
tudinal. Bone attachment to the laser micromachined surfaces is strong enough to measure in tension and tensile-tested specimens often show bone left behind in the microgrooves. Bone surfaces exposed after implant removal always show extensive bone attachment and growth into the microgrooves, with trabecular attachments spreading parallel to the microgrooves and blending together to form continuous bands.

Electron microscopic results suggest that these surfaces cause orientation of attached cells, which produces oriented extracellular matrix and oriented bone microstructure. This is not observed on textured or polished surfaces. Textured surfaces show moderate direct bone attachment, which is not directional, and polished surfaces show little direct bone attachment and mostly fibrous encapsulation.

Crestal bone loss around endosteal implants is a common phenomenon. Ricci et al. reported 2.17 ± 1.6 mm of crestal bone loss at 5 years postoperative and Zechner et al. reported 2.4 ± 0.23 mm of loss at 3 to 7 years. Even as early as 1 year postoperative, Abboud et al. reported up to 1.21 mm of crestal bone loss and Bryant and Zarb reported 1.4 mm loss. Taylor et al. and De Leonards et al. using an implant with a similar screw thread and screw surface as the implant used in this experimental study found 1.23 mm and <1 mm of bone loss, respectively.

The clinical question addressed by the study described here is as follows: Will the laser microtexturing surface treatment of the implant collar reduce crestal bone loss and establish a stable soft-tissue seal with no increase in inflammation measures such as bleeding and plaque index?

**MATERIALS AND METHODS**

This study evaluates the Silhouette Dental Implant (Laser-Lok (LL), Bio-Lok International, Deerfield Beach, FL) with laser microtexturing surface treatment of the implant collar (LL) versus a control tapered implant with a standard machined collar (control implant). The control implant used in this study is a tapered implant with a reverse butress thread design and a 2 mm wide collar. The body of the implant has been roughened by blasting with a resorbable blast media. The Silhouette with laser microtexturing surface treatment has the same body design and screw area surface treatment as the control, but has a laser micromachined collar. This implant, shown in Figure 1, has a 2 mm wide collar that has been laser micromachined in the lower 1.5 mm. The lower, 0.8 mm (bone contacting) region, has been laser grooved with 12 μm wide by 10 μm deep grooves that have been previously shown in preclinical studies to optimize the surface for bone attachment. The next 0.7 mm of the collar has been laser grooved with 8 μm wide by 5 μm deep grooves that have been previously shown to optimize the surface for connective tissue attachment. The upper 0.5 mm of the collar, as machined, encourages epithelial tissue colonization.

**Baseline Demographic Data**

Clinical testing has been performed by the group for implant research in Italy. The 2 implants are compared against each other and with historical controls previously published on the Bio-Lok Micro-Lok implant system. Each patient received 2 single tooth implants, with and without laser surface treatment (LL vs control implant). All implants were restored at 4 months postoperative. The study was performed with 5 investigators and a total of 15 patients who received 20 sets of implants. The patients included 6 men and 9 women ranging in age from 42 to 69 years old with a mean age of 55.8 years. Among the 20 implant pairs, 8 were in the mandible and 12 were in the maxilla.

**Fig. 1.** Positioning of the laser microtextured collar in bone.

**Fig. 2.** At implant placement and 25 months postoperative, 44 year, male. Control and Silhouette with Laser-Lok surface treatment (LL).
Each patient signed a consent form indicating the experimental nature of the devices, the purpose of the study, their rights, and their obligations.

Endpoints

A comparison between means was done using $t$ tests for all measurements and the resulting $P$ values were recorded.

Effectiveness endpoints. The primary effectiveness endpoints are probing depth (the average of 4 measurements taken at the mesial, buccal, distal, and lingual surfaces of the implant) and crestal bone loss (average of the 2 radiographic measurements taken at the mesial and distal locations of the implant).

Safety endpoints. The safety endpoints are plaque index and sulcular bleeding index. Each of these endpoints are measured at the mesial and distal locations of the implant.

All measurements were initiated at 1-month postoperative, after soft tissue healing and were done at 2-month intervals up to 37 months.

RESULTS

Patient Accountability

No patient was lost to follow-up. In one patient (patient 1) the site implanted with the LL implant failed to osseointegrate and the implant was removed. All other implants, LL and control implant, have been followed for the full 37 months.

Effectiveness Results

X-rays for a typical case postoperatively and at 25 months are shown in Figure 2 for a 44-year-old male. The crestal bone seems to be retained around the Silhouette with laser surface treatment (LL), whereas there is noticeable bone loss evident around the implant without laser surface treatment (control implant).

The 2 primary effectiveness endpoints are probing depth and crestal bone loss. The differences between the LL and control implants were tested at each study visit by a paired $t$ test.

As seen in Figure 3, the LL treatment yielded consistently lower probing depth at each visit with significance for all time periods ($P < 0.001$). As seen in Figure 4, LL was numerically superior to control implant in crestal bone loss at each month after month 1, and achieved nominal statistical significance at month 7 ($P = 0.003$), and each month thereafter ($P < 0.001$). This difference is seen to increase numerically at each successive visit.

All 20 implant pairs were included in analyses up to 7 months, and only 19 pairs at months 9 through 37. This is because the LL implant in patient 1 failed at 7 months and the implant was removed. To conduct an intent to treat analysis, which uses all implants, a difference between treatments of zero (consistent with the null hypothesis of no effect due to the LL surface treatment) was imputed for all missing data for Patient 1 for both probing depth and crestal bone loss, and the aforementioned analyses were repeated. The resulting differences at each of the visits in which a value was imputed (months 9–37) remained significant ($P < 0.001$).

A subgroup analysis was performed on the 20 pairs of implants to compare implants in the mandible with those in the maxilla. Mean differences between treatments were computed for probing depth and crestal bone loss. LL was numerically superior to the control implant at each month for implants in the mandible and implants in the maxilla, for both probing depth and crestal bone loss. However, there is no statistical significance to these data. Therefore, the data only suggest a possible greater effect of LL surface treatment on implants in the maxilla than in the mandible.

**Fig. 3.** Probing depth, LL versus control for 37-month follow-up. Error bars = standard error: $P < 0.005$ for all time periods.

**Fig. 4.** Crestal bone loss, LL versus control for 37-month follow-up. Error bars = standard error: $P < 0.005$ after month 5.
Justification for Pooling Investigators

Five surgeons implanted between 2 and 7 pairs of implants each. To assess the poolability of the data from these 5 surgeons, the month 37 data for each of the effectiveness endpoints was analyzed by surgeon. The means for each surgeon and treatment were computed, along with the differences between treatments. The LL treatment was consistently superior to the Silhouette for each endpoint and surgeon. This consistency of treatment effect among the 5 surgeons indicates that the data are poolable.

Safety Results

The safety endpoints were plaque index and sulcular bleeding index. All individual values for each of these indices were either a 0 or a 1, hence, the resulting averages of the mesial and distal determinations were either a 0, 0.5 (one value was 0 and the other was 1), or 1. The resulting data at each visit are shown in Figures 5 and 6, respectively. A one-sided 95% upper confidence bound on the differences in the means was computed. No statistically significant differences in the 2 data sets were found except for sulcular bleeding at 21 and 37 months where LL was superior. Generally, however, there seems to be no clinically significant safety endpoint differences between LL and control implant.

Discussion

The Silhouette design implant combines proven design concepts (reverse buttress thread and high surface area microtextures) with a novel tapered design. The Silhouette implant with LL surface treatment combines these Silhouette features with organized microtextures in critical areas. The Osseo-Lok high surface area microtexture on the threaded portion of the implant has been shown in preclinical animal testing to enhance bone apposition to the implant. The LL surfaces have been shown to inhibit fibrous encapsulation, enhancing bony attachment in bony areas, enhance the formation of a soft-tissue seal in soft-tissue areas and control local tissue microarchitecture. This combination of organized cells and organized extracellular matrix results in unique tissue formation at the interface resulting in true “endosseous incorporation.”

The bleeding index for both implants after the initial healing period ranges from 0.45 to 0.03 with no statistical difference between pairs except at 2 time points where LL is superior. The historical data from an earlier study of Bio-Lok implants presents a range from 0.00 to 0.50 with a mean of 0.25. The plaque index goes as high as 0.27 for the control implants and 0.25 for the LL implants with no statistical difference between pairs. The historical data had a mean plaque index of 0.27, close to the highest mean at any time period for either the LL or the control implants. These data indicate that there is no increase in these inflammation measures (bleeding and plaque indices) as compared with either prospective controls or historical data.

The consistent difference in probing depth between the implant pairs with and without the Laser microtexture surface treatment implies that a soft-tissue seal above the bone has been established in the LL implanted sites. This was demonstrated histologically in a previous canine implant study. Accounting for the crestal bone loss with both implants, an ~1.0 to 0.7 mm probing difference is maintained throughout the study. This is approximately the height of the 8 μm texturing (0.7 mm) on the LL implant.

The crestal bone loss data are the most dramatic result of this study. The LL bone loss is limited to 0.59 mm whereas the control data demonstrates up to 1.94 mm of bone loss. The data reported for other implant systems is in the range from 1.0 to 2.5 mm. The LL surfaced implant is superior in this important measure to consecutive controls and literature reports on other implant systems.

Conclusions

The combined results of this study with preclinical animal studies and analyses have demonstrated that it is not necessary to accept up to 2.5 mm of crestal bone loss around dental implants.
as has been proposed in the literature. At 3 years postoperative the Silhouette implant with LL surface treatment enables the reduction of crestal bone loss to 0.59 mm. It is hypothesized that this has been accomplished by reducing the stress in the crestal bone through a combination of implant design and surface modifications and effecting soft-tissue attachment above the bone. These benefits, accomplishing true “endosseous incorporation,” were demonstrated without any degradation in plaque index and sulcular bleeding index as compared with controls.

Disclosure
The authors claim to have no financial interest, directly or indirectly, in any entity that is commercially related to the products mentioned in this article.

References

Reprint requests and correspondence to: J. L. Ricci, PhD
New York University College of Dentistry
345 East 24th Street, Room 813B
New York, NY 10010
Phone: 212-998-9623
Fax: 212-995-4244
Cell: 732-778-8296
E-mail: john.ricci@nyu.edu

Klinische Beurteilung von Laser-Mikrostrukturierungsbehandlungen an Weichgewebe und Knochenbefestigungen für Zahnimplantate

ZUSAMMENFASSUNG: Einleitung: Ein spitz zulaufender Zahnimplantat (LL) mit einer Kragenweite von 2 mm, das mittels Laser in den unteren 1.5 mm mikrobearbeitet wurde, um darüber eine Verbesserung der Knochen- und Bindegewebsanhäufung zu erzielen, während gleichzeitig Epithelienfleckenverlust verhindert werden soll, wurde in einer klinischen, kontrollierten, Multizentren-Prospektivstudie bewertet. Materialien und Methoden: Es werden Angaben zu Messzeitpunkten von 1 bis zu 37 Monaten nach erfolgtem operativem Eingriff für 20 Paare von Implantaten bei insgesamt 15 Patienten festgehalten. Die Implantate werden direkt neben Kontrollimplantaten mit maschinell bearbeitetem Kragen (C) des gleichen Designs eingesetzt. Es werden die nachfolgenden Messwerte festgehalten: Blutungsindex, Plaque-Index, Sondierungstiefe und Knochengeräuscherneinversturz in der Kammergegend. Ergebnisse: Es ergeben sich keinerlei statistische Unterschiede für sowohl den Blutungs- als auch den Plaque-Index. Zu allen Messzeitpunkten gab es maßgebliche Unterschiede in der Sondierungstiefe. Außerdem sind die Unterschiede hinsichtlich des Knochengeräuscherneinversturzes in der Kammergegend nach 7 Monaten bedeutend (P < 0.001). Nach 37 Monaten lag die durchschnittliche Sondierungstiefe bei 2.30 mm und der durchschnittliche Knochengeräuscherneinversturz im Kammmknocheln betrug 0.59 mm für LL gegenüber 3.60 mm bzw. 1.94 mm für C. Vergleicht man außerdem die Ergebnisse im Unterkiefer mit denen im Oberekiefer, so weisen sich größere Unterschiede (C minus LL) im durchschnittlichen Knochengeräuscherneinversturz in der Kammergegend und in der Sondierungstiefe im Oberekiefer.
on. Additionally, these results are consistent with the statistical significance mentioned. **Discussion and Conclusion:** The percentage difference between LL and C appears to be statistically insignificant. The design of the dental prosthesis, alveolar bone, implant surface, and the retention of LL at the maxillary level was comparable to the retention of C at the maxillary level. LL showed a greater relative difference in comparison to C in the mean alveolar bone loss at the 0.59 mm level, as opposed to 3.60 mm and 1.94 mm reported for C. The implant LL was comparable to the implant C, with a significantly greater relative difference between LL and C compared to the maxillary level. LL was shown to have a greater relative difference compared to C in the mean periodontal index at the points extremities and the mean periodontal index of the sulcus. This suggests a non-statistically significant improvement in the retention of LL compared to C at the mandibular level. **PALABRAS CLAVES:** Pérdida de hueso alveolar/etiología, diseño de la prótesis dental, hueso cresta, superficie del implante.
considerado comparável ao implante C em índice de placa de parâmetros de segurança e índice de sangramento sulcal. Há uma sugestão estatisticamente não significativa de que a superioridade de retenção da crista óssea de LL é maior na maxila do que na mandíbula.

PALAVRAS-CHAVE: perda de osso/etiologia, projeto de prótese dentária, crista óssea, superfície de implante

RUSSIAN / РУССКИЙ


Клиническая оценка влияния лазерного микротекстурирования на прикрепление мягких тканей и кости к зубным имплантатам

РЕЗЮМЕ: Введение: В рамках проспективного контролируемого многоцентрового клинического исследования была проведена оценка зубного имплантата конической формы (LL) с шейкой шириной 2 мм, нижние 1,5 мм поверхности которого подверглись микробиоработке лазером, чтобы, в первую очередь, обеспечить фиксацию кости и соединительнотканный связки десневой кармана, и в то же время препятствовать образованию эпителиального дефекта. Материалы и методы: Представлены данные за периоды измерений продолжительностью от 1 до 37 месяцев после установки 20 пар имплантатов 15 пациентам. Имплантаты установлены рядом с контрольными имплантатами с полированной шейкой (C) той же конструкции. Значения измерений были предоставлены для следующих величин: индекс кровоточивости, индекс налета, глубина зондирования, потеря костной массы альвеолярного гребня. Результаты: В отношении индексов кровоточивости и налета статистической разницы обнаружено не было. Во все периоды измерений статистическое значительное расхождение для глубины зондирования и потери костной массы альвеолярного гребня наблюдается после 7 месяцев (p<0.001). Через 37 месяцев средняя глубина зондирования составляет 2,30 мм и средняя потеря костной массы альвеолярного гребня — 0,59 мм для имплантата типа LL по сравнению с 3,60 мм и 1,94 мм соответственно для имплантата типа C. Также, если сравнить результаты, полученные для нижней и верхней челюстей, заметна большая разница (С минус LL) в средних значениях потери костной массы альвеолярного гребня и глубины зондирования на верхней челюсти. Однако эти результаты не являются статистически значимыми.

Обсуждение и выводы: Систематически наблюдаемая разница между значениями глубины зондирования для имплантатов типов LL и С подтверждает формирование постоянного барьера из мягкой ткани на альвеолярном гребне. Имплантаты типа LL сокращают потерю костной массы альвеолярного гребня до 0,59 мм, в отличие от потери костной массы альвеолярного гребня 1,94 мм, что получено для имплантатов типа C. Оказалось, что имплантаты типа LL сравнимы с имплантатами типа C в максимальных безопасных значениях индексов налета и кровоточивости. Существует статистически незначимое предположение, что ретенция альвеолярного гребня при установке имплантатов типа LL больше выражена на верхней челюсти, чем на нижней.

КЛЮЧЕВЫЕ СЛОВА: Потеря костной массы альвеолярного гребня / причины потери костной массы альвеолярного гребня, конструкция зубных протезов, альвеолярный гребень, поверхность имплантата

TURKISH / TÜRKÇE


Dental Implantlara Yumuşak Doku ve Kemik Bağlanması için Lazerle Yapılan Mikrotekstürün Klinik Değerlendirmesi

ÖZET: Giriş: Prospektif, kontrollü, çok merkezli klinik bir çalışmadı, alt 1,5 mm’lik kısında kemik ve bağı dokusunun bağlanmasını sağlamak fakat aşağıya doğru epitel büyüümeyi inhibe etmekte üzere lazerle mikrotekstür yapılmışı, 2 mm genişliğinde kelepçesi olan konik bir dental implant (LL) değerlendirdi. Gereç ve Yöntem: 15 hastadaki toplam 20 çiţi implantan operasyon sonrasındaki 1. aydan 37. aya kadar ölçüm süresinde alınan veriler değerlendirildi. Implantlar, aya tabanında, makineden geçmiş kelepçeyi içeren kontrol (K) implantların yanna yerleştirildi. Şu kategorilerde ölçüm değerleri alındı: Kanama Endeksi, Plak Endeksi, Prob Deriniği ve Kret Kemik Kaybı. Bulgular: Kanama veya plak endeksinde istatistiksel bir farklılık görüldü. Tüm ölçüm dönenlerinde prob deriniklarinde anlamlı farklılıklar bulundu ve kret kemik kaybı farklılıklar 7. aydan sonra anlamlı idi (P < 0,001). 37. ayda LL için ortalama prob deriniği 2.30 mm ve ortalama kret kemik kaybı 0.59 mm iken K için bunlar.
sirasiyla 3.60 mm ve 1.94 mm idi. Ayrıca, alt çeneye ait sonuçların maksilladan alınan değerlerle karşılaştırması 
(K’ye karşılık LL) maksillada ortalama kret kemik kaybı ve prob derinliği açısından daha büyük bir farklılık gösterdi de, bu fark istatistiksel yönden anlaşılmadı. **Tartışma ve Sonuç:** LL ile K arasında prob derinliğine ilişkin olarak görülen tutarlı farklılık, kret kemiğinin üstünde stabil bir yumuşak doku oluşumuna işaret etmektedir. LL için kret kemik kaybı 0.59 mm düzeyinde kalması ve buna karşın, K için kret kemik kaybı 1.94 mm olarak kaydedilmiştir. LL implantının, güvenilir son noktaları plak endeksi ve sulkus kanama endeksi açısından K implantına benzer olduğu görüldü. İstatistiksel olarak önemli olmamakla beraber, LL için kret kemiğinin maksillada alt çeneye nazaran daha üstün bir şekilde korunmuş olduğu düşünülmektedir.

**ANAHTAR KELİMELER:** alveoler kemik kaybı/etiyoloji, dental protez tasarım, kret kemig, implant yüzeyi

**JAPANESE / 日本語**

デンタルインプラントへの軟組織と骨付着を目的とするレーザーマイクロテクスチャリング加工臨床評価

共同研究者氏名: GE・ペコラ（GE Pecora）DDS, MD, R・セッカレリ（R Ceccarelli）DDS, M・ボネリ（M Bonelli）DDS, H・アレキサンドラー（H Alexander）PhD, JL・リッチ（JL Ricci）PhD

研究概要:
序論: 上皮組織の根尖側移動を抑制しながら、骨と接続組織付着を優先的に達成するために下部1.5mmをレーザーマイクロマシン加工した2mmワイドカラー付先細デンタルインプラント（LL）を、将来を見込んだ対照マルチセンター臨床テストで評価した。

素材と方法: 15名の患者に埋入したインプラント20対のデータを、術後1ヶ月から37ヶ月の測定期間で記録した。これらのインプラントは、同デザインのマシーンカラー-コントロールインプラント（C）に隣接して埋入されたものである。測定値は次の項目で記録された：Bleeding Index, Plaque Index, Probing Depth そして歯槽頂骨吸収である。

結果: Bleeding IndexあるいはPlaque Indexのどちらにも統計上差異は測定されなかった。測定全期間においてProbing Depthと歯槽骨吸収に著しい差異が見られ、7ヶ月後にはかなりの差異を示している（p<0.001）。37ヶ月目にはLLの平均Probing Depthは2.30 mmで平均歯槽骨吸収が0.59 mm、これに対してCはそれぞれ3.60 mmと1.94 mmを示した。また、下顎骨に対して上顎骨を比較した結果にも、下顎骨の歯槽骨吸収とProbing Depth対する差異が明らかになっている（CマイナスLL）。しかし、この結果は統計上重要とみなさない。

論考と結論: LLとC間の一貫したProbing Depth差異は歯槽骨上にしっかりと固定する軟組織が形成されていることを明らかにしている。Cで記録された1.94 mmの歯槽骨吸収に対して、LLは歯槽骨吸収を0.59 mm範囲内に抑えており、LLインプラントは安全性エンドポイントPlaque Indexと歯肉Bleeding IndexにおいてCインプラントと比較に値することが判明している。また、非統計でLL歯槽骨保持に関しては下顎骨よりも上顎骨でより優勢を示しているという重大な示唆も提示されている。

キーワード: 歯槽骨吸収/病因学, 義歯デザイン, 歯槽骨, インプラント表面

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ご質問の宛先: JL Ricci, PhD, New York University College of Dentistry, 345 East 24th Street, Room 813B, New York, NY 10010, US
電話: 212-998-9623 FAX: 212-995-4244 携帯電話: 732-778-8296 電子メール: john.ricci@nyu.edu

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軟組織與牙科植體附着的雷射微組織臨床評估

作者：GE Pecora, DDS, MD; R Ceccarelli, DDS; M Bonelli, DDS; H Alexander, PhD; JL Ricci, PhD

摘要：
簡介：在一項控制的前瞻性多中心臨床試驗中評估一顆頭徑寬 2mm 的椎狀牙科植體 (LL)，在阻止上皮再生的同時也將其下方 1.5mm 經雷射微機電化，以優先完成骨與繽紛組織連結。

資料與方法：報告包括 15 名患者共 20 對植體在手術後 1 到 37 個月的測量資料。將植體放置在相同設計的機械化齒頸控制植體 (C) 旁。報告測量值包括出血指數、牙菌斑指數、探測深度以及骨壁流失。

結果：測量的出血指數及牙菌斑指數沒有統計差異。植體深度在所有測量期間都出現顯著差異，骨壁流失在 7 個月後有顯著差異 (p<0.001)。在 37 個月的平均探測深度是 2.3mm；LL 平均骨壁流失為 0.59 mm，C 則分別為 3.60mm 和 1.94 mm。同時，比較下頷和上頜結果，顯示下頷的平均骨壁流失以及探測深度有較大的差異 (C 小 LL)，不過結果並不顯著。

討論與結論：LL 與 C 在探測深度的一致性差異，顯示骨壁上軟組織密封穩定形成。LL 將骨壁流失限制在 0.59 mm 範圍內，相反的，C 則出現 1.94 mm 的骨壁流失。LL 在安全療效指標牙菌斑指數和牙齦溝內出血指數上可與 C 植體比較。LL 的上頜骨壁保持比下頜高，不過沒有統計差異。

關鍵字：齶槽骨流失／病因、牙科擴張設計、骨壁、植體表面

通訊方式：JL Ricci, PhD, New York University College of Dentistry, 345 East 24th Street, Room 813B, New York, NY 10010, USA
電郵信箱：john.ricci@nyu.edu 電話：212-998-9623 傳真：212-995-4244 手機：732-778-8296
치아 입플랜트에 대한 연부조직 및 골 부착 면에서 레이저미세구조슬의 임상적 평가

저자: GE 페코라 (GE Pecora), 구강의과박사 (DDS), 의학박사 (MD), R. 세차렐리 (R Ceccarelli), 구강의과박사 (DDS), M 보넬리 (M Bonelli), 구강의과박사 (DDS), H 알렉산더 (H Alexander), 의학박사 (PhD), JL 리시 (JL Ricci), 의학박사 (PhD)

요약:

도입: 상피세포 하강성장을 억제하면서 골 및 결합조직 부착을 이루기 위해 레이저 미세기계를 이용해 1.5mm로 점자 가늘게 만든 2mm 너비 관의 치아 임플랜트 (LL)를 전향적, 내측, 디기관 임상시험에서 평가하였다.


결과: 출혈 또는 치석 지표 면에서 등계학적인 차이는 확인되지 않았다. 모든 측정기간 중 7개월 후에 탈침질이 및 골능선 소실 면에서 유의적인 차이가 확인되었다 (p<0.001). 37개월제, LL에서 평균 탈침질이는 2.30mm였고 평균 골능선 소실은 0.59mm였으며, C에서는 각각 3.60mm 및 1.94mm였다. 또한, 하약 결과와 상악 결과를 비교한 결과, 상악에서 평균 골능선 소실 및 탈침질이 면에서 더 큰 차이 (C-LL)가 관찰되었다. 그러나, 이러한 결과는 통계학적으로 유의적이지 않았다.

토론 및 결론: LL 및 C 사이의 일관된 탈침질이 차이를 통해 일정한 연부조직 형성으로 골능선 위가 바뀌지는 것으로 확인된다. LL은 0.59mm 범위로 골능선 소실을 제한한 반면, C에서의 골능선 소실은 1.94mm였다. LL 임플랜트는 안전성 중점적인 치석지표 및 염구출혈지표 면에서 C 임플랜트와 유사한 것으로 확인되었다. LL 골능선 유지가 하야보다 상약에서 더 우세하다는 사실은 통계학적으로 유의적이지 않다.

키워드: 치교결 소실/원인, 치아 보철물 설계, 골능선, 임플랜트 표면

연락정보: JL 리시 (JL Ricci), 의학박사 (PhD), New York University College of Dentistry, 345 East 24th Street, Room 813B, New York, NY 10010, USA
전화: 212-998-9623 팩스: 212-995-4244 휴대폰: 732-778-8296 이메일: john.ricci@nyu.edu
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AQ1—Kindly check whether the short title is OK.

AQ2—Please spell out the first name of the first and last authors.

AQ3—Please check whether the expansion of LL is OK.

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