



저작자표시 2.0 대한민국

이용자는 아래의 조건을 따르는 경우에 한하여 자유롭게

- 이 저작물을 복제, 배포, 전송, 전시, 공연 및 방송할 수 있습니다.
- 이차적 저작물을 작성할 수 있습니다.
- 이 저작물을 영리 목적으로 이용할 수 있습니다.

다음과 같은 조건을 따라야 합니다:



저작자표시. 귀하는 원저작자를 표시하여야 합니다.

- 귀하는, 이 저작물의 재이용이나 배포의 경우, 이 저작물에 적용된 이용허락조건을 명확하게 나타내어야 합니다.
- 저작권자로부터 별도의 허가를 받으면 이러한 조건들은 적용되지 않습니다.

저작권법에 따른 이용자의 권리는 위의 내용에 의하여 영향을 받지 않습니다.

이것은 [이용허락규약\(Legal Code\)](#)을 이해하기 쉽게 요약한 것입니다.

[Disclaimer](#) 

2010년 2월

석사학위논문

Clinical evaluation of a collagen matrix
to enhance the width of keratinized
tissue around dental implants

조선대학교대학원

치의학과

이강호

Clinical evaluation of a collagen matrix
to enhance the width of keratinized
tissue around dental implants

임플란트 주위의 각화조직을 확보하기 위한
collagen matrix의 임상적 평가

2010년 2월 25일

조 선 대 학 교 대 학 원

치 의 학 과

이 강 호

Clinical evaluation of a collagen matrix
to enhance the width of keratinized
tissue around dental implants

지도교수 장 현 선

이 논문을 치의학 석사학위신청 논문으로 제출함.

2009년 10월 일

조 선 대 학 교 대 학 원

치 의 학 과

이 강 호

이강호의 석사학위 논문을 인준함.

위원장 조선대학교 교수 김흥중 인

위원 조선대학교 교수 김병옥 인

위원 조선대학교 교수 장현선 인

2009 년 11월 일

조선대학교 대학원

Contents

List of figures	ii
List of table	iii
Abstract	iv
I. Introduction	1
II. Materials and methods	3
III. Results	7
IV. Discussion	8
V. Conclusion	10
References	11
Abstract in Korean	14

List of Figures

Fig. 1. Group 1 - Apically positioned flap	13
Fig. 2. Group 2 - APF combined with free gingival grafts(FGG)	13
Fig. 3. Group 3 - APF combined with collagen matrix coverage	14
Fig. 4. Collatape [®] Zimmer Dental, California, USA	14

List of Table

Table 1. The change of keratinized width	14
--	----

ABSTRACT

Clinical evaluation of a collagen matrix to enhance the width of keratinized tissue around dental implants

Kang-Ho Lee

Advisor: Prof. Hyun Seon Jang, D.D.S., M.S.D.,

Ph.D.

Department of Dentistry,

Graduate School of Chosun University

Keratinized tissue is a specialized mucosa covered with keratin or parakeratin includes the free and attached gingiva and extend from the gingival margin to the mucogingival junction. However the need and significance of keratinized tissue around dental implants is a controversial issue. The objective of this study was to evaluate the width of keratinized tissue after apically repositioned flap (APF), APF combined with Free gingival graft(FGG), and APF combined with collagen matrix coverage at implant second surgery.

This study was designed to evaluate the width of keratinized tissue after apically repositioned flap (APF), APF combined with free gingival grafts(FGG), and APF combined with collagen matrix coverage(Collatape[®] Zimmer Dental, California, USA) at implant second surgery. The increase ratio was each of 0.3, 0.6, 0.6 in the APF group. Each of 3, 5, 7 in the APF combined with FGG group. And each of 1.5, 0.5, 3 in the APF combined with collagen matrix coverage group. This result showed that, the keratinized tissue increased significantly

in the FGG group, and mild to moderate increase of keratinized tissue were gained in the APF and APF combined with collagen matrix coverage groups. This study suggests that this collagen matrix when used as a soft tissue substitute aiming to increase the width of keratinized tissue or mucosa, was as effective and predictable as the FGG.

I. Introduction

The purpose of soft tissue management around dental implants are successful primary closure, papillary reconstruction, gain of keratinized tissue and preservation of ridge contour. Keratinized tissue is a specialized mucosa covered with keratin or parakeratin includes the free and attached gingiva and extend from the gingival margin to the mucogingival junction. But, the need and significance of keratinized tissue around dental implants is a controversial issue. Wennstrom et al.¹⁾ reported that there is no clinical difference between teeth with or without adequate keratinized tissue and no association between the width of keratinized tissue and the presence of bleeding on probing. Bengazi et al.²⁾ reported that the width of keratinized tissue was a poor predictor of soft tissue recession occurring. The recession was mainly the result of a remodeling of the soft tissue for establishing an appropriate biological dimensions. Albreksson et al.³⁾ reported that dental implants may have a high survival rate irrespective of keratinized conditions. Although the significance of keratinized tissue is still controversial issue, it is certain that the attached gingiva provides increased resistance of the periodontium to external injury, contributes to the stabilization of the gingival margin position, and aids in the dissipation of physiological forces that are exerted by the muscular fibers of the alveolar mucosa onto the gingival tissues.⁴⁾ Despite the observation that the lack of keratinized tissue does not influence long term implant survival, the preservation and or the reconstruction of keratinized tissue around dental implants may be important. Many surgical techniques have been utilized to augment gingival tissue dimensions. Langer et al.⁵⁾

suggested techniques to obtain adequate amounts of keratinized tissue around two stage implants, mainly based on the preservation of keratinized tissue over the edentulous ridge. At the time of implant exposure, apically positioned flaps or lateral-positioned flaps were proposed to reconstruct an adequate width of keratinized tissue around implants. When the amount of keratinized tissue over the edentulous ridge was minimal, a free gingival graft (FGG) was suggested. This techniques are, however, associated with significant patient morbidity due to the need to create a wound at the palatal donor site. Recently, many of this disadvantage of the classic procedure have been overcome by modification of procedure and use of tissue engineering materials. Laurell et al.⁶⁾ used an acellular dermal matrix allografts to achieve increased attached gingiva. Simion⁷⁾ used a collagen membrane for soft tissue healing. More recently, a collagen matrix has been proposed as a substitute for the palatal donor tissue to augment gingival tissue dimensions.⁸⁾ The objective of this study was to evaluate the width of keratinized tissue after apically repositioned flap (APF), APF combined with FGG, and APF combined with collagen matrix coverage at implant second surgery.

II. Materials and method

1. Subjects

Nine patients were selected from those attending the department of periodontics in the Chosun University Dental Hospital of Gwang Ju, if they fulfilled the following criteria:

- 1) Patients were periodontally and systemically healthy.
- 2) Presenting at least one location with minimal or no keratinized tissue.
- 3) All patients were treated implant second surgery 4 months after implant first surgery.

After the patients has received through information from the investigator and has signed the ethics committee-approved informed consent form.

This study protocol was approved by the Chisun University Dental Hospital Instruction Review Board(CDMDIRB-0902-14).

2. Experimental design

This study was designed to evaluate the width of keratinized tissue after apically repositioned flap (APF), APF combined with free gingival grafts(FGG), and APF combined with collagen matrix coverage(Collatape® Zimmer Dental, California, USA) at implant second surgery. The timing of soft tissue management was at implant second surgery, 4 months after implant first surgery. For proper standardization between baseline and follow up data, the periodontal probes were used for measurements of keratinized tissue. And it was measure vertically from the gingival crest level.

The APF combined with collagen matrix coverage group is experimental group and APF and APF combined with FGG group is control group.

3. Surgical procedure

Three different surgical technique was performed to nine patients. The criteria of surgical techniques was decided by follows:

1) If the keratinized tissue was more than three millimeters, then apically

positioned flap technique has performed.

2) If the keratinized tissue was between two and three millimeters range, then

APF combined with collagen matrix coverage technique has performed.

3) If the keratinized tissue was minimal, then APF combined with FGG technique has performed.

At the time of the surgery, local anesthesia was administered and the surgical procedure was performed. After patient selection, the three groups underwent a surgical procedure in order to enlarge the area of keratinized tissue. The surgical technique used consisted of the following steps:

· Group 1 - Apically positioned flap

Using a #15C blade (Ace Surgical Supply Co, Germany), a mucosal partial thickness flap was raised. The recipient site was prepared by sharp dissection in order to create a periosteal bed free of any muscle attachment. The resulting flap was sutured at the base of the newly created vestibule with 5-0 non resorbable nylon sutures (Happyton,

Shirakawa Co, Japan) (Fig.1)

· **Group 2 - APF combined with free gingival grafts(FGG)**

Free gingival grafts were performed according to the original technique described by Sullivan and Atkins. A recipient bed was prepared similar with group 1 and a free graft was harvested from the palate (Fig.2)

· **Group 3 - APF combined with collagen matrix coverage**

After preparation of recipient site, Collagen matrix was trimmed and shaped to fit the recipient site. And Collagen matrix was fixed same as FGG method (Fig.3) All the three group of patients were then instructed to rinse twice daily with a chlorhexidine mouth rinse (0.12%) for 2 weeks. Anti-inflammatory therapy(Amoxicillin 625mg) was prescribed and patients were given instructions to take this drug for three days. Sutures were removed after 10 days. The used collagen matrixs in this clinical evaluation are Collatape[®] (Zimmer Dental, California, USA) supplied in sterile, individual bubble packs in the following configurations (Fig.4) It is fabricated using collagen obtained from bovine deep flexor (Achilles) tendon, and functions bleeding controls, stabilizes blood clots, protects wound bed, provides matrix for tissue ingrowth and absorbs in about 10-14 days. but, if it is exposed directly to oral environment, absorbed more rapidly. To test the toxicity of Collatape[®], Dr.Luitaud seeding the epithelial cells onto the CollaTape[®], and epithelium formation was followed at various time points. The epithelial cells adhered, proliferated, and began to stratify as early as 2 days post-seeding. Advanced stratification was obtained at 6 days post-seeding. This result confirming the nontoxic capability

of the CollaTape material on fibroblast adhesion and growth.⁹⁾

4. Clinical measurements

The clinical evaluation of this outcome was performed by measuring the distance from the gingival crestal to the mucogingival junction at the mid-buccal point, using a periodontal probe.(PCP 10, Hu-Friedy, Chicago, IL, USA). It was recorded at the pre-operatively and after soft tissue healing.

Results

This study population consisted of 9 patients, Three in the apically positioned flap group (APF), three in the APF combined with FGG, three in the APF combined with collagen matrix coverage group. No patient in any of the groups developed any significant complication. The changes in the primary outcome of this study (increase in keratinized tissue) are shown in Table 1. The increase ratio was each of 0.3, 0.6, 0.6 in the APF group. Each of 3, 5, 7 in the APF combined with FGG group. And each of 1.5, 0.5, 3 in the APF combined with collagen matrix coverage group. This result showed that, the keratinized tissue increased significantly in the FGG group, and mild to moderate increase of keratinized tissue were gained in the APF and APF combined with collagen matrix coverage groups. At baseline, the width of keratinized tissue of FGG group were absolutely minimal and the other groups showed similar width of keratinized tissue range from 1-3mm. The amount of keratinized tissue had increased 3-4 weeks after surgery in all the 3 groups. In APF combined with collagen matrix coverage group show similar or more amount of keratinized tissue increase with only APF areas. But, as if APF combined with FGG areas, APF combined with collagen matrix coverage group also showed favorable physiologic morphology than only APF group.

V. Discussion

Although the controversy regarding the need for an 'adequate' width of keratinized tissue around teeth in order to preserve periodontal health still exists, there are clinical situations where the presence of a certain width of keratinized tissue may be important in maintaining periodontal health and preventing soft tissue recession, such as in areas around fixed prosthetic restorations.¹⁰⁾ And despite the observation that the lack of keratinized tissue may not influence implant survival the careful management of soft tissue around implants is considered essential by clinicians.¹¹⁻¹⁵⁾ The increase of keratinized tissue has been performed traditionally using the free gingival graft.¹⁶⁾ And Augmentation of keratinized tissue width and vestibular deepening with autogenous free gingival grafts have been reported predictable and effective method¹⁷⁻¹⁹⁾. Although the incidence of complications is very low, discomfort and pain at the donor site are frequently observed. But this technique makes the other wound at palatal site, and increase the morbidity of the patient. To avoid this morbidity, substitute for palatal donor tissue were studied. For examples acellular dermal matrix allograft, collagen membrane, collagen matrix were used instead of palatal tissue. Although the acellular dermal matrix allograft shows good result at soft tissue augmentation, because this material is derived from human cadavers, it is associated with ethical concerns and the possible risk of disease transmission.²⁰⁻²²⁾ Collagen membrane also showed good effect at soft tissue augmentation and healing, but collagen matrix have more porous layer so that achieve more keratinized tissue by including a space creating effect and blood clot

formation.²³⁾ So, the collagen matrix expected more effective at keratinized tissue augmentation. The main objective of this clinical study is to evaluate the changes of the width of keratinized tissue following three surgical techniques, apically repositioned flap (APF), APF combined with FGG, and APF combined with collagen matrix coverage. The result from this clinical study keratinized tissue achieved all the three groups after 3-4 weeks, proliferation and maturation is progressed in this time. The FGG group showed significant increase of keratinized tissue, and APF combined with collagen matrix coverage group showed more keratinized tissue increase than only APF group, also the characteristic of keratinized tissue after surgery in APF combined with collagen matrix coverage group showed more physiologic and favorable morphology than only APF group. Maybe it was believed that collagen matrix act as scaffold to disturb the apically positioned flap move to coronally, and protection of the recipient bed. So it is considered APF combined with collagen matrix coverage areas showed physiologic and favorable morphology. But the evidence about this advantage of collagen matrix is insufficient. So further studies are necessary to determine the influence of collagen matrix to the recipient bed, and to prolong the short absorption period of collagen matrix(10-14 days).

V. Conclusions

Keratinized tissue augmentation around dental implant may need to be considered in some clinical situations. This study suggests that this collagen matrix when used as a soft tissue substitute aiming to increase the width of keratinized tissue or mucosa, was as effective and predictable as the FGG.

Reference

1. Wennström J, Bengazi F, Lekholm U. The influence of the masticatory mucosa on the peri-implant soft tissue condition. *Clin Oral Implants Res* 1994;5:1 - 8.
2. Bengazi F, Wennström J, Lekholm U. Recession of the soft tissue margin at oral implants. A 2-year longitudinal prospective study. *Clin Oral Implants Res* 1996;7:303 - 310.
3. Albrektsson T, Zarb G, Worthington P, Eriksson A. The long-term efficacy of currently used dental implants: a review and proposed criteria of success. *Int J Oral Maxillofac Implants* 1986;1:11 - 25.
4. Lang NP, Löe H. The relationship between the width of keratinized gingiva and gingival health. *J Periodontol* 1972;43:623 - 627.
5. Langer B, Sullivan DY. Osseointegration: its impact on the interrelationship of periodontics and restorative dentistry: part I. *Int J Periodontics Restorative Dent* 1989;9:84 - 105.
6. Laurell L, Geivelis M. Acellular dermal matrix allograft to achieve increased attached gingiva : part I. *J Periodontol* 2000;71:1297-1305.
7. Simion M. Soft tissue healing on application of a natural collagen matrix. 6th Congress of the European Federation of Periodontology June 4-6, 2009 Stockholm, Sweden
8. Sanz M, Lorenzo R. Clinical evaluation of a new collagen matrix to enhance the width of keratinized tissue in patients with fixed prosthetic restorations: a randomized prospective clinical trial. *J Clin periodontol* 2009;36:868-876.

9. Luitaud C, Laflamme C. Development of an Engineering Autologous Palatal Mucosa-Like Tissue for Potential Clinical Applications. *Tissue Engineering in dentistry* 2006;Received 9 June;revised 24.
10. Barone R, Clauser C, Grassi R, Merli M, Pini Prato GP. A protocol for maintaining or increasing the width of masticatory mucosa around submerged implants: a 1-year prospective study on 53 patients. *Int J Periodontics Restorative Dent* 1998;18:377 - 387.
11. Pini Prato GP, Clauser C, Cortellini P. Periodontal plastic and mucogingival surgery. *Periodontology* 2000 1995;9:90 - 105.
12. Dorfman HS, Kennedy JE, Bird WC. Longitudinal evaluation of free autogenous gingival grafts. *J Clin periodontol* 1980;7:316 - 324.
13. Wennström J, Lindhe J, Nyman S. Role of keratinized gingiva for gingival health. Clinical and histologic study of normal and regenerated gingival tissue in dogs. *J Clin periodontol* 1981;8:311 - 328.
14. Wennström J, Lindhe J. Role of attached gingiva for maintenance of periodontal health. Healing following excisional and grafting procedures in dogs. *J Clin periodontol* 1983;10:206 - 221.
15. Kennedy JE, Bird WC, Palcanis KG, Dorfman HS. A longitudinal evaluation of varying widths of attached gingiva. *J Clin periodontol* 1985;12:667 - 675.
16. Langer B, Langer L. Subepithelial connective tissue graft technique for root coverage. *J Periodontol* 1985;56:715 - 720.
17. Bohannon H. Studies in the alteration of vestibular depth I. Complete denudation. *J Periodontol* 1962;33:120-127.
18. Egli U, Vollmer WH, Rateitschak KH. Follow-up studies of free gingival grafts. *J Clin periodontol* 1975;2:98-104.

19. Han TJ, Takei HH, Carranza Fa. The strip gingival autograft technique. *Int J Periodontics Restorative Dent* 1993;13:180-187.

20. Park JB. Increasing the width of keratinized mucosa around endosseous implant using acellular dermal matrix allograft. *Implant Dentistry* 2006;15:275 - 281.

21. Yan JJ, Tsai AY, Wong MY, Hou LT. Comparison of acellular dermal graft and palatal autograft in the reconstruction of keratinized gingiva around dental implants: a case report. *Int J Periodontics Restorative Dent* 2006;26:287 - 292.

22. Imberman M. Gingival augmentation with an acellular dermal matrix revisited: surgical technique for gingival grafting. *Pract Proced Aesthet Dent* 2007;19:123 - 128.

23. Hammerle CH, Jung RE, Feloutzis A. A systematic review of the survival of implants in bone sites augmented with barrier membranes (guided bone regeneration) in partially edentulous patients. *J Clin periodontol* 2002;29:226 - 231.

임플란트 주위의 각화치은을 확보하기 위한 Collagen Matrix의 임상적 평가

이강호

지도교수 : 장현선

조선대학교 대학원 치의학과

임플란트 주위의 연조직 처치의 목적은 크게 일차의도 봉합, 치간유두 재건, 각화치은의 확보 그리고 치조융선의 보존 및 처치이다. 그중에서 적절한 각화치은의 존재는 치주조직을 외부손상 으로부터 보호하며 치은변연의 위치를 안정적으로 위치시키고 조직에 가해지는 생리적인 힘을 분산해주는 기능을 한다.

본 연구의 목적은 근단 변위 판막술, 유리 치은 이식술을 동반한 근단 변위 판막술, 그리고 Collagen matrix 피개를 동반한 근단 변위 판막술을 각각 시행한 경우 부착치은의 증가량을 평가하고자 한다.

조선대학교 치과병원 치주과에 내원한 임플란트 환자로 식립 4개월이 경과한 환자 12명을 대상으로 하였다. 모두 2차수술시에 각화치은을 확보하기로 하였다. 2차 수술시에 근단 변위 판막술, 유리 치은 이식술을 동반한 근단 변위 판막술, 그리고 Collagen matrix 피개를 동반한 근단 변위 판막술 세 그룹으로 나누어 치유 후 각화치은의 폭을 비교하였다. 각화치은의 폭은 Periodontal probe 를 이용하여 각각 술전과 치유 후(술후)에 측정하였다. 연구결과 유리 치은 이식술을 동반한 근단 변위 판막술을 시행한 그룹에서 각화치은의 증가량이 가장 크게 나타났고 근단 변위 판막술, 그리고 Collagen matrix 피개를 동반한 근단 변위 판막술을 시행한 그룹에서도 양호한 정도의 증가량을 확인 할 수 있었다. 그 증가 비율은 근단 변위판막술 그룹에서 0.3, 0.6, 0.6 유리 치은 이식술을 동반한 근단 변위 판막술을 시행한 그룹에서 3, 5, 7 Collagen matrix 피개를 동반한 근단 변

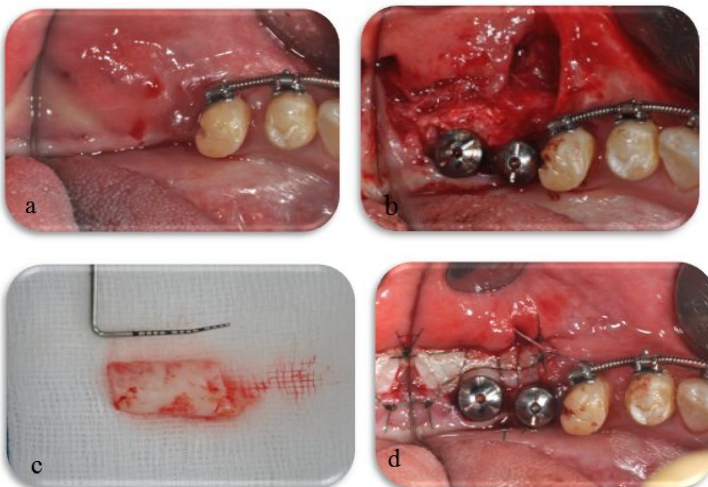
위 관막술을 시행한 그룹에서 1.5, 0.5, 3 으로 나타났다. 단 Collagen matrix를 적용한 그룹은 근단 변위 관막술만 시행한 그룹보다 좀더 양호하고 생리적인 형태의 각화치은이 확보된 것을 관찰할 수 있었다.

Figures



Fig 1. Group 1 - Apically positioned flap

(a) Pre surgical image of #36 implant site. Note the approximately 3mm width of keratinized tissue exist. (b) Split partial thickness flap was elevated and sutured at the base of the newly created vestibule with 5-0 non resorbable nylon sutures. (c) Five months after prosthetic setting, the keratinized tissue was well maintained. But, vertical incision at the time of surgery made a frenum at #35 distal area.



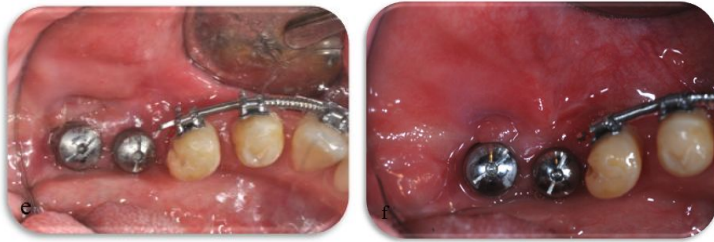


Fig 2. Group 2 - APF combined with free gingival grafts(FGG)

(a) Pre surgical image of #36,37 implant site. Note the minimal amount of keratinized tissue on the edentulous ridge. (b) Split partial thickness flap was elevated and sutured at the base of the newly created vestibule with 5-0 non resorbable nylon sutures. (c) Dimension of the free gingival graft retrieved from the patient's palate. (d) Free gingival graft sutured on the recepient bed. (e) Healing of the free gingival graft after three weeks post surgery. Note the presence of 3~4mm of keratinized tissue around healing abutment. (f) Some shrinkage has happened after 3months.





Fig 3. Group 3 - APF combined with collagen matrix coverage
 (a),(b) Pre surgical image of #36 implant site. 2~3mm of keratinized tissue exist especially vertically. Note the adjacent teeth buccal gingival line, keratinized tissue loss was detected after tooth loss. (c) Split partial thickness flap was elevated (d),(e) Flap was sutured at the base of the newly created vestibule with 5-0 non resorbable nylon sutures. (f) Experimental collagen matrix covered the recipient bed. (g),(h) One months after, 2mm of keratinized tissue gained vertically and horizontally. (i),(j) Well maintained keratinized tissue after 5 months.



Fig 4. (Collatape[®] Zimmer Dental, California, USA)

Table

Table 1. The change of keratinized width

Patient No.	Group	Site	Width of keratinized tissue		
			Baseline	Post-surgery	Increase(ratio)
1	APF	#47	3mm	4mm	0.3
2	APF	#36	3mm	5mm	0.6
3	APF	#35	3mm	5mm	0.6
4	APF+FGG	#34,35,36	0.5mm	2mm	3
5	APF+FGG	#36,37	0.5mm	3mm	5
6	APF+FGG	#14,15,16	0.5mm	4mm	7
7	APF+CM	#47	1mm	2.5mm	1.5
8	APF+CM	#14	2mm	3mm	0.5
9	APF+CM	#36	1mm	4mm	3

저작물 이용 허락서

학 과	치의학과	학 번	20087257	과 정	석사
성 명	한글 이강호	한문	李康豪	영문	Lee Kang Ho
주 소	광주 동구 산수1동 544-10				
연락처	E-mail : superterious@hanmail.net				
논문제목	한글 Collagen wound dressing 피개를 동반한 근단변위판막술 후 부착치은 확보량에 관한 연구:human study				
	영문 The study of attached gingiva gain after apically positioned flap with collagen wound dressing				

본인이 저작한 위의 저작물에 대하여 다음과 같은 조건 아래 조선대학교가 저작물을 이용할 수 있도록 허락하고 동의합니다.

- 다 음 -

1. 저작물의 DB구축 및 인터넷을 포함한 정보통신망에의 공개를 위한 저작물의 복제, 기억장치에의 저장, 전송 등을 허락함.
2. 위의 목적을 위하여 필요한 범위 내에서의 편집과 형식상의 변경을 허락함. 다만, 저작물의 내용변경은 금지함.
3. 배포·전송된 저작물의 영리적 목적을 위한 복제, 저장, 전송 등은 금지함.
4. 저작물에 대한 이용기간은 5년으로 하고, 기간종료 3개월 이내에 별도의 의사 표시가 없을 경우에는 저작물의 이용기간을 계속 연장함.
5. 해당 저작물의 저작권을 타인에게 양도하거나 출판을 허락을 하였을 경우에는 1개월 이내에 대학에 이를 통보함.
6. 조선대학교는 저작물 이용의 허락 이후 해당 저작물로 인하여 발생하는 타인에 의한 권리 침해에 대하여 일체의 법적 책임을 지지 않음.
7. 소속 대학의 협정기관에 저작물의 제공 및 인터넷 등 정보통신망을 이용한 저작물의 전송·출력을 허락함.

동의여부 : 동의() 반대()

2010년 2월

저작자: 이강호 (인)

조선대학교 총장 귀하