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SURGICAL RESEARCH APPLICATIONS USING SUBEPITHELIAL CONNECTIVE TISSUE GRAFT FOR RECOVERING EXPOSED TOOTH ROOT SURFACE

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INTRODUCTION

The apical migration of the gingival margin is called gingival recession. Gingival recession may occur on proper or misaligned teeth, crown or bridge teeth, dental implant teeth. Gingival recession may lead to many problems and functional aesthetics.

The percentage of gingival recession is relatively high in the World and Vietnam. Surgery treatment for gingival receded tooth patients has not been done much in Vietnam's hospitals and dental offices.

For that reasons, we performed the study named " **Surgical research application using subepithelial connective tissue graft for recovering exposed tooth root surface**". This method combines the advantages of the pedicle flap methods and the autogenous free gingival graft.

The goals of the study are:

1. *Comment the clinical features of the gum receding cases*
2. *Evaluate the results of surgery about its safety, recovering the denuded roots and changes of the gingival index.*

URGENCY OF THE THESIS:

The gingival recession is common in people, however the treatment is little done at Vietnam Hospitals and Dental offices. The research on the treatment of Vietnam was less done. Our research focuses on the connective tissue grafting, this method is more internationally recognized as highly effective for covering the tooth root surface.

PRACTICAL IMPLICATIONS AND CONTRIBUTIONS OF THE THESIS:

The results of the treatment showed that more than 71% of the tooth root surface was recovered. This surgery is safe and effective at covering the

rooth surface. The aesthetic and functional results were maintained stabiy in the follow-up time. This surgery is highly applicable and can be implemented in all Dental offices and Hospitals.

THESIS STRUCTURE:

Introduction 2 pages, Overview 29 pages, Subjects and Methods 17 pages, Results 34 pages, Discussion 23 Pages, Conclusion 3 pages. There are 93 references.

Chapter 1: OVERVIEW

1. DEFINITION OF GINGIVAL RECESSION:

Gingival recession is a process in which the gingival margin receded to the apex of the root (according to Glickman [15]).

2. CLASSIFICATION OF GINGIVAL RECESSION:

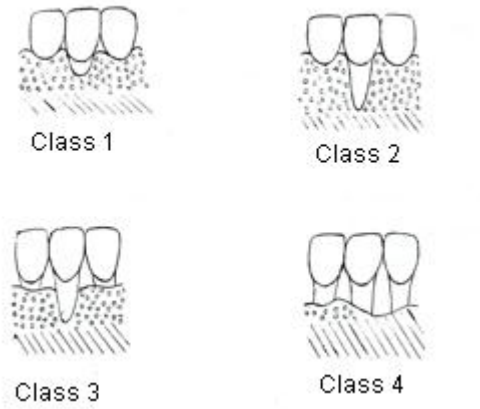
- Miller's classification [16]:

Class 1: The recession does not extend to the muco-gingival junction and the periodontal tissue between teeth is not destroyed. Prognosis: the whole denuded tooth root surface may be recovered by surgery.

Class 2: The recession extends to or beyond the muco-gingival junction and the periodontal tissue between teeth is not destroyed. Prognosis: the whole denuded tooth root surface may be recovered by surgery.

Class 3: The recession extends to or beyond the muco-gingival junction and the interdental periodontal tissue is injured. Prognosis: the denuded tooth root surface may be recovered partly by flap surgery.

Class 4: class 3 plus loosen teeth resulting from periodontitis. Prognosis: Surgery treatment for covering denuded tooth root surface cannot be successful. If these teeth are indicated to be conserved, do surgery for augmenting attached gingiva.



Picture 1.10: Miller's classification [16]

3. CAUSES AND FACILATING FACTORS OF GINGIVAL RECESSION:

There are many causes of gingival recession such as physiological, pathological, traumatic or a combination of these causes. Moawia M.Kassab et al [17] aggregated some studies and concluded that there are many causes leading gingival recession.

- **Pathological causes:**

Periodontitis, deep periodontal pockets often lead to gingival recession.

- **Traumatic causes:**

Incorrect tooth brushing technique at a long time makes gum worn. Khocht A et al reported that there was a relation between hard tooth brushing habit and gingival recession [18].

Occlusal trauma is a favorable factor that makes gingival recession aggravate because it can lead to more epithelial proliferation and local inflammation.

- **Physiological causes:**

Physiological gingival recession increases with age, gingival recession rate increase from 8% at child age to 100% at age of 50 (according to Glickman [15]). After a study in Germany 1991 on 11401 people, Kleber-BM concluded that 10,4% of persons had gingival recession at age of 16 to19; 24,8% of persons had gingival recession at age of 20 to 24; 46,8% of persons had gingival recession at age of 35 to 44 [19].

- **Physiological and anatomical favorable factors:**

The gingival recession is affected by the position of the teeth in the arch, the angle of the tooth root in the jaw. For example: the canine erupts toward the labial side, the outer bone layer is thin and the gingiva is thin too, therefore it is easy for the gingival margin to recede.

4. **CONSEQUENCES OF GINGIVAL RECESSION:**

- The denuded tooth root surface is easy to be decayed.
- Tooth root cement surface is worn by hard brushing habit leading to dentin hypersensitivity.
- It is easy for food debris, plaque and bacteria to adhere to tooth root surface at interdental space.
- Compromise esthetic if gingiva recession occurs on front teeth.

5. **STUDY ABOUT GINGIVAL RECESSION IN VIETNAM AND ON THE WORLD:**

Along with the development of cosmetic dentistry, gingival recession has been more concerned.

In 2000, Arowojulu reported the gingival recession rate of a group of Nigeria people: ages 16-25 : 22%; ages 56-65 : 58% [3].

In 2002, Hoanguan and colleagues reported the results of studies on the gingival recession of adult groups in Thailand: : ages 51 - 59 : 49,6%, ages

70 - 92 : 72%, gingival recession had been more prevailed in men than women [4].

In 2004, Sucin C et al examined 1460 people in the urban area of Brazil and obtained results: More than half (51.6%) and 22.0% of the individuals and 17.0% and 5.8% of teeth per individual showed gingival recession > or = 3 mm and > or = 5 mm, respectively [1].

In 2012, Minaya-Sanchez et al reported the gingival recession ratio in pure Mexican men: The mean number of sites with gingival recession per subject was 4.73; the prevalence was 87.6%.

In 1999, Long Le Nghia reported a research on 178 patients at National Odonto-Stomatology hospital about gingival recession rate: ages 18-25: 72,16%; ages 35-44 : 98,77% [5].

6. GINGIVAL RECESSION TREATMENT:

Gingival recession is a periodontal tissue defect and should only be treated by surgery. Surgical treatment has divided into three groups:

***Pedicle flap surgery:**

-Laterally sliding flap.

-Oblique rotated flap.

-Double papilla sliding flap.

-Cervically repositioned flap.

- Semilunar flap.

***Autogenous mucosal tissue graft:**

-Autogenous free gingival graft.

-Subepithelial connective tissue graft.

***Using membrane combined with pedicle flap:**

- Acellular dermal matrix graft.

- Guided tissue regeneration.

7. RESEARCHES ABOUT SUBEPITHELIAL CONNECTIVE TISSUE GRAFT:

In 2008, Ahathya RS et al did a study in India, at 6 months post surgery, the result was 87.5% of denuded tooth root surface recovered [27]. In 2008, Sergio L.S et al performed a clinical trial following-up of two Brazillian groups: the non-smoking group had better result than the smoking group [28]. Also in Brazil by the year 2006, Carvalho performed surgery and followed-up 6 months, the effectiveness of recovering the exposed tooth root surface was 96.7% [29]. Harris et al in U.S. in 2007 after 6 months of postoperative follow-up showed the result that 95.4% of denuded root surface was covered [30]. In 2002 he also performed the surgery on single denuded roots and multiple denuded roots and found that the sing tooth root surface was covered much more (90,3 % and 77%, respectively)[31]. In 2007 Dembowska E et al did a research in Poland and followed-up 12 months, the result was 72.2% of exposed root surfaces recovered [34]. Rossberg M et al studied a research on 39 teeth in Germany, he got the result of covering 89.7% of root surfaces after 6 years [32]. In Tehran, Sadat Mansouri S et al in 2010 studied 18 teeth with receded gum grading I and II, 6 months later he achieved 85.7% of exposed root surfaces recovered [33]. Cardaropoli 2011 tracked 12 months after surgery and showed the results 96% of toot root coverage [34]. Nguyen Phu Thang's research in 2011 in Hanoi: 11 cases transplanted autogenous connective tissue to cover the tooth root surface, after 3 months there were 8 tooth roots were recovered partly [35].

Chapter 2: SUBJECTS AND METHODS

2.1. Subjects of study.

The study was performed on patients with tooth or group of teeth with gum recession examined at the Hanoi University of Medicine and Dental Center 225 Truong Chinh with the selection and exclusion criteria below.

2.1.1. **Selection criteria:**

Gingival recession grade I, II and III according to the classification of Miller [16] and there is no acute or chronic periodontitis.

2.1.2. Exclusion criteria:

Exclusion of patients with 1 of the following criteria:

Having the acute systemic illness or unstable chronic diseases such as diabetes, heart disease ...

Pregnant women at the first 3 months and the last 3 months.

Smoking patients.

Denuded teeth are loosen.

Donor region (palatal mucosa from the first premolar to the first molar) has no sufficient thickness at least 2.5 mm (when the patient agrees to the surgery, before the start of the incisions, anesthesia the soft tissue at premolar palatal side and estimate the depth of the needle).

Other diseases, such as inflammation of the mouth, tumors, cysts that interfere the surgery.

A history of allergy to anesthetics and antibiotics.

2.2. Time and place of study:

From March 2009 to December 2012. Study sites are Odonto-Stomatology Department (before November 2009), Medical University Hospital and Dental Center 225 Truong Chinh.

2.3. Research methodology:

2.3.1. Study design and sampling:

The uncontrolled open clinical intervention research to evaluate the effectiveness of the before-after model. The patient had a tooth or group of teeth had agreed to have had gingival surgery was included in the study by convenient sampling, monitoring results, comparing before and after treatment.

2.3.2. Sample size:

The research is on the patients, but the evaluation of the results of the surgery is on the teeth (actually the patients had 2 or 3 gingival recession teeth and the gingival recession grades were different and results of recovering tooth surfaces on the same patient might vary), we calculate the sample size by teeth.

The number of surgery teeth was calculated using the formula [61]:

We preferred $\alpha = 5\%$. Power samples $1-\beta = 80\%$.

po = 92% according to research by Yong-Moo Lee et al [62]. pa: re-covering ratio of the root surfaces estimated in this study (approximately 80%).

N is equal to 43. In our study 49 gingival recession teeth were operated.

2.4. The research steps:

2.4.1. Gather information before surgery: according to study design form.

1. Administrative information.

2. The reason to visit doctor.

3. Examine oral hygiene: based on OHI-S index (CI-S indices and DI-S indices) of Green and Vermillion in 1964 [63].

2.4.2. Steps to conduct research and gather information in surgery:

*** Prepare patients:** Patients and family members (if patients were under 18) were explained and signed a consensus to participate in research.

Blood counts and basic clotting tests were done.

*** Preparation of drugs, devices and surgical materials.**

*** The surgical steps:**

We carried out the surgical steps according to Langer B. and Langer L.'s. the method [25]:

- Disinfect and anesthesia the surgical area.
- The recipient site (the gingival recession site) were incised by two incisions: sulcular incision and papillary incision.
- Papillary incision: Make a 1 mm deep, horizontal and perpendicular incision to the interdental papilla at the level of the cement-enamel junction or slightly coronally to cement-enamel junction.
- Sulcular incision: this internal bevel incision is along with the margin of gingiva and connects the papillary incisions on both sides. The incision should be extended one more tooth on both sides for ease of flap releasing.
- The blade 15 lip is used to lift the flap and small tissue pliers are used to the reflected edge. A partial thickness flap is prepared apically while the edge is pull slowly, with care taken to avoid penetrating the flap. A partial thickness incision is extended sufficiently beyond bone edge for access to the root surface and coronal displacement of the flap.
- After flap reflection, a recipient site is prepared, a curette is used for root planning, granulation tissue and calculus are removed.
- Measure the height and width of the exposed root by placing the periodontal probe on the root surface. Grind exposed root surface to reduce the curvature of the root surface. If there is a cervical erosion, grind the root surface to the bottom of the erosion. After grinding may be no cement left on

the root surface.

- Donor site: The soft palate mucosa from the distal of the canine to the distal of the first molar. Antisepsis and anesthesia the mucosa at a distance about 5-7 mm from the gingiva border. The first incision parallel to the border of the gingival margin.

- Add 1 or 2 more incision that perpendicular to the first incision at the both ends of the first incision. Connective tissue is dissected from the mucosa with pouch opening style. The connective tissue layer and the overlay mucosa are about 1.5 to 2 mm thick. If the mucosa is not thick enough, peel off the bone membrane, piece of connective tissue is removed and washed with saline and then soaked in physiological saline.

- The mucosa is sewn with polypropylene 5.0 or Vicryl 5.0.

The recipient site is prepared to receive the connective tissue:

- Removing granulation tissue, clean and smooth the root surface by grinding the root surface with smooth burs. Root surface is exposed flat and at horizontal plane to alveolar bone. Exposed root surfaces are highlighted with saturated citric acid for 3 minutes then rinse with saline.

- Calculate the time of soaking the connective tissue in the saline water.

-The connective tissue graft is placed on the receiving surface in any direction, the edge of the connective tissue graft should leap over the margin of the exposed root surface about 2 to 3 mm, at the cervical portion the connective tissue graft should leap on the enamel margin. Sew connective tissue graft that hung around tooth neck with prolene 6.0.

- Reposition the flap over the connective tissue graft and sew the flap with interrupted and hanging suture. It is not needed to cover the graft completely. During the healing process, the epithelial cell with lap over the connective tissue, this is different from the method using the membrane.

- Pressed saline gauze to surgical areas for about 3 minutes to avoid dead space between the flap and the connective tissue graft, the dead space between the graft and the recipient surface. Put the periodontal cement on the surgical wound.

***Gather information during surgery:** the thickness of the palatal mucosa corresponding to the teeth 4, 5, 6; the time of soaking the connective tissue in the saline solution, enveloped flap or releasing incision flap.

***Guide to care for patients after surgery:**

On the first day, to avoid the risk of bleeding in the mouth, the patient should eat soft food, if the surgical site bleeds, take 1 moist tea bag and place on the bleeding site and bite, then go to see a dental surgeon immediately.

To avoid possible gingival flap and connective tissue graft slipped, eat soft food and don't chew hard for the first week, do not brush teeth in the surgical area during the first two weeks, just clean gently with a cotton swab and betadine solution and saline via syringe, from the 3^{rd} week, brush teeth gently with a soft brush, brush from the gingiva to the teeth.

***Postoperative:**

Patients have checked the next day, 1 week later, periodontal dressing replaced at the 7th day, periodontal dressing taken off at the 12^{th} day, suture cut and removed at the 12^{th} day.

Post-surgery drugs: Rodogyl (Spiramycine 750000UI combination with Metronidazole 125mg) dose of 4 to 6 tablets / 7 days depending on patient weight. Efferalgan 500mg * 3 times the first 2 days after surgery. Alpha chymotrypsin 21μkatal edema, drink 2 tablets * 3 times per day the first week.

2.4.3. Collecting information after surgery:

- Is there any symptoms of bleeding and infection at the first week after surgery?

- Evaluate the results at the first week, 3, 6 and 12 months post-surgery.

*** After the first week:**

At the recipient site: after removal of periodontal dressing, observe the color of the soft tissue. If it is red, it is not covered by the epithelial layer. If there is spotted white color, it is epithelial cells. If the soft tissue is necrosis, it will turn pale. Don't assess the inflammation at this time because in the healing phase there is inflammatory response. If there is pus, it is considered less effective. Evaluation Criteria at the first week are shown in Table 2. 1:

Criteria	**Highly effective group**	**Fairly effective group**	**Badly effective group**		
% of re-covering the longitudinal root surface	≥ 80%	<80%--≤60%	≥ 80%	<80%--≤60%	<60%
Abcess	No	No	Yes or no		

The first and 3rd months: Table 2.2: evaluate the surgical effectiveness of re-covering the root surface:

Criteria	**Highly effective group**	**Fairly effective group**	**Badly effective group**		
% of re-covering the longitudinal root surface	≥ 80%	<80%--≤60%	≥ 80%	<80%--≤60%	<60%
Symtoms of gingivitis	No	No	Yes or no		

- Evaluation of recipient site: gingival condition: Is there any inflamatory symptoms or not? The width of keratinized gingiva. The

horizontal and vertical size of gingival recession. Ratio of vertical root surface re-covering.

- At palate: Is there soft tissue depressions or not?

The 6th and 12th months: Table 2.3: evaluate the surgical effectiveness of re-covering the root surface:

Criteria	**Highly effective group**	**Fairly effective group**	**Badly effective group**		
% of re-covering the longitudinal root surface	≥ 80%	<80%--≤60%	≥ 80%	<80%--≤60%	<60%
Symtoms of gingivitis	No	No	Yes or no		
Probing depth	≤ 3 mm	≤ 3 mm	> 3mm		

In addition to criteria at the time of 3rd month, there are some more criteria: the size of attached gingiva in mm. Probing depth. Loss of attachment.

2.5. Data processing:

The data collected in the study were entered into computer using Microsoft access software and processed with the software Stata 10.0 with the algorithm-square test, student's t-algorithm.

2.6. Ethics in research:

- Research council has adopted proposals and allowed to implement.

- Conduct research to ensure medical ethics.

Chapter 3: RESULTS

3.1. GENERAL CHARACTERISTICS OF RESEARCH SUBJECTS :

Table 3.3: Characteristics of surgeries.

Characteristics of the operations / Parameters	Number of teeth each surgery			Number of surgeries			Total number
	1 tooth	*2 adja--cent teeth*	*3 adja--cent teeth*	*1 time*	*2 times*	*3 times*	
Number of the surgeries	5						**25**
		16					
			4				
Number of teeth	5	32	12				**49**
Number of patients				20			**22**
					1		
						1	

Comments:

- The 2 adjacent teeth per surgery accounted for the highest number (16/25), 5 surgeries with one tooth and 4 surgeries with three adjacent teeth together.

- There is one patient had two surgeries separated by six months. One patient had 3 surgeries, the time interval between surgeries are twelve months and six months, respectively. Two these patients are female. The remaining of patients had 1 surgery.

3.2. SAFETY LEVEL

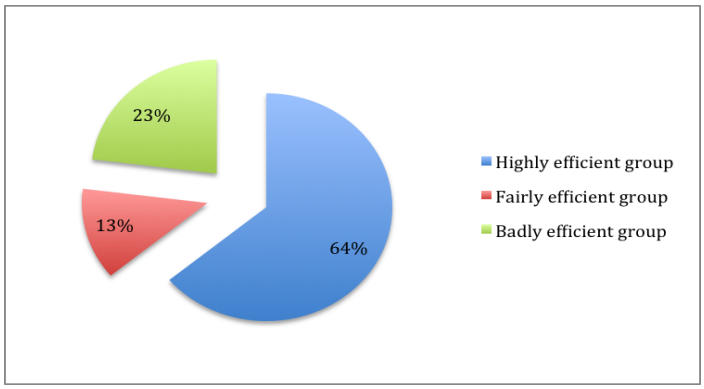
Table 3.12: Status of bleeding and infection of the surgery.

Time	**n**	Bleeding		Number of infection case
		Recipient site	*Palate*	
The first day	25	0	0	0
The first week	25	0	0	0

Comment: Based on the table above, this is a safe operation, without any surgery complications of bleeding and infection.

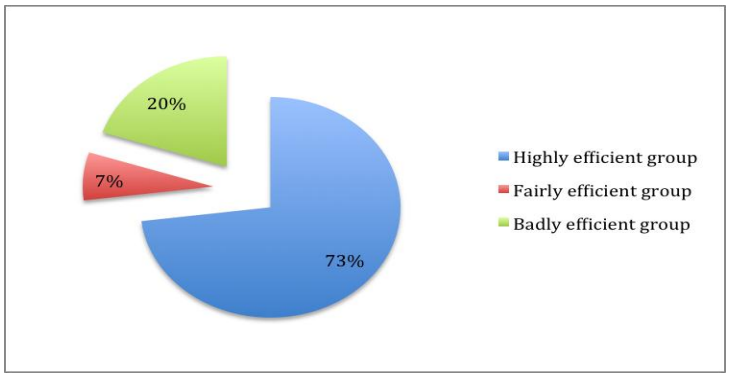
3.3. RESULTS:

Chart 3.1: Effectiveness of the surgery at 1ST week post-surgery.



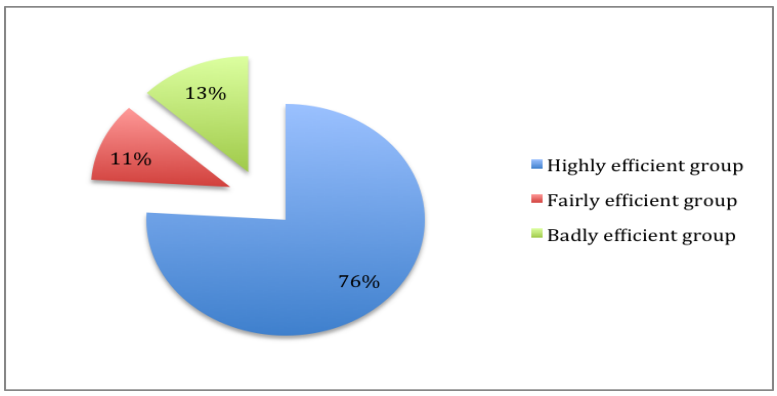
Comment: With the two criteria: the percentage of vertical re-covering the tooth root and there was abscess or not, at the 1st week post-surgery the rate of high effectiveness was 64% (that were the case of recovering the root surface 80 % or more and there were no abscesses).

Chart 3.2: Effectiveness of the surgery at 3rd month post-surgery.



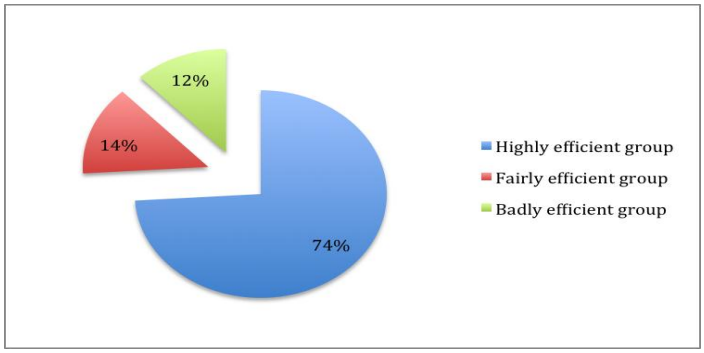
Comment: The ratio of high effectiveness at 3rd month post-surgery was 73%, increased comparing to 1st week, but this increase was not statistically significant (p> 0.05).

Chart 3.3: Effectiveness of the surgery at 6th month post-surgery.



Comment: At the time of 6th month post-surgery, the rate of high-efficiency group was 76%, higher than that at 3rd months but not significantly (p> 0.05).

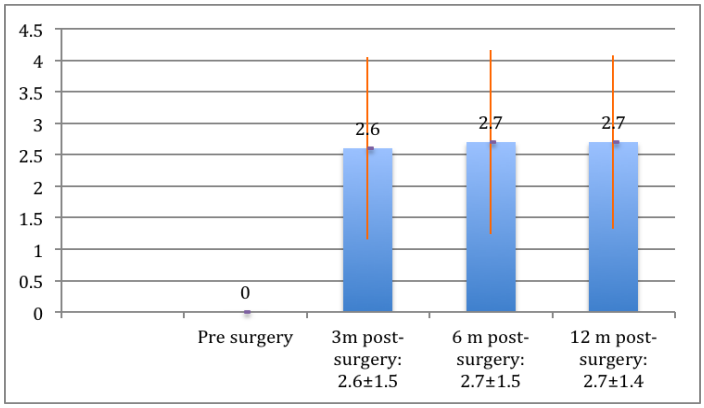
Chart 3.4: Effectiveness of the surgery at 12th month post-surgery.



Comment: At 12th months post-surgery, the rates of high, fair and bad efficiency were almost the same as those at 6th post surgery (p> 0.05).

Root coverage results after surgery:

Chart 3.5: Results of vertical recovering the root surface (in mm) at the time of following-up after surgery.



Green: average values.
Red: standard deviation.

Comment: the average of recovering the root surface at visit times after surgery were more than 2.5 mm, the change from the pre-surgery to post-

surgery was statistically significant (p values <0.01). Results achieved at the time of 1st, 3rd, 6th, 12th months were not differently significant (p> 0.05).

The rate of recovering 100% of the root surface at the times after surgery.

Table 3.16: Percentage of recovering 100% of the root surface at the times after surgery.

Times / **Parameters**	**3rd month**	**6th month**	**12th month**
Recovering 100% of the root surface	33/45=73,3%	34/46=73,9%	25/35=71,4%
Recovering under 100% of the root surface	12/45=26,7%	12/46=26,1%	10/35=28,6%
P (compared to 3rdmonth post-surgery)		**>0,05**	**>0,05**

Comments: The rate of recovering the root surface entirely at 3rd, 6th, 12th months post-surgery were no different with p> 0.05. In general, over 71% of tooth rooth surfaces were fully covered.

The probing depth before and after surgery.

Table 3:20: Comparison of probing depth before and after the operation:

Times / **Parameters**	*Before surgery*	6th month post surgery	12th month post surgery	18th month post surgery	24th month post surgery
Nmber of teeth (n)	49	46	35	11	8
Probing depth(mm)	1,2± 0,5	1,0± 0,4	1,0± 0,4	0,9± 0,2	0,9± 0,2
p (compared to pre-surgery)		<0,01	<0,01	<0,01	<0,01
p (compared to 6th post surgery)			>0,05	>0,05	>0,05

Comment: probing depth at 6th, 12th, 18th and 24th months post-surgery reduced with no statistical significance compared with the pre-operative score (p values <0.01). At the time of 12th, 18th and 24th months after surgery the probing depth changed without statistical significance compared to the 6th months post-surgery (p values> 0.05).

Keratinized gingiva at the time before and after surgery:

Table 3:21: The change of keratinized gingiva at the post-surgery visits:

Times / **Parameters**	*Before surgery*	3rd month PS	6th month PS	12th month PS	18th month PS	24th month PS
Nmber of teeth (n)	49	45	46	35	11	8
Width of attached gingiva (mm)	2,4± 1,8	4,2± 1,5	4,2± 1,5	4,1± 1,6	5,4± 1,4	5,0± 0,9
p (compared to pre-surgery)		<0,01	<0,01	<0,01	<0,01	<0,01
p (compared to 3rd post-surgery)			>0,05	>0,05	>0,05	>0,05

Comment: The width of keratinized gingiva at 1st, 3rd, 6th, 12th and 18th months had increased significantly compared with the pre-operative score (p values <0.01). The width of keratinized gingiva between 6th, 12th and 18th months visits did not change significantly compared to 3rd month (p values> 0.05).

Chapter 4: DISCUSSION

4.1. DISCUSS THE GENERAL CHARACTERISTICS OF RESEARCH SUBJECTS:

Features of surgeries:

Based on table 3.3: the proportion of the surgeries with 2 adjacent teeth was major. Most patients participated 1 times, although many of these

patients still had gingival recession teeth after the first surgery. There were 1 patient having had 2 surgeries and 1 patient having had 3 surgeries, both patients were female. Obstacles of having further surgery for most patients were the discomfort in the mouth in the first week after surgery.

4.2. DISCUSSION OF RESULTS OF SURGERY:

The effect of surgeries:

The surgeries were considered effective when the denuded root surfaces were recovered and the graft stuck to the root surfaces. The color of the soft tissue and hypersensitivity were not considered the criteria for success of the surgeries because this surgery was a harmonious colored surgery and it was difficult to find the sensitive spot on the cervix or on the root.

Based on chart 3. 1: The ratio of high efficiency levels at the 1st month was 64%, at that time we had only two criteria: the percentage of recovering the vertical tooth root equal to 80% or more and no abscess, we did not rely on probing depth because according to some authors during the 1st month after surgery the graft did not stick to the tooth root surface [52]. During the first 4 weeks patients were instructed not to brush the surgery area and cleaned with saline spray, that were the reasons why there was slight gingivitis because not all plaque was thoroughly removed.

As chart 3.2, at the 3rd month the success rate of high efficiency was 73%, comparing with the first week after surgery the rate increased because a number of teeth at the 1st week had recovered 80% or more of root surface but there were gum disease symptoms, at 3rd month the teeth were good plaque controlled so gingivitis reduced and increased the high efficiency ratio, but the difference between these scores were not statistically significant.

At the time of 6th month after surgery, the success rate of high efficiency was 76%, from that time onwards the probing depth of 3 mm or less was added to the criteria for evaluating surgical effectiveness, grafts were attached to root surface or not were assessed by probing depth, if the gingiva did not adhere to the foot surface, it would make a gingival pocket.

At 1 year after surgery (chart 3.4), the success rate of high efficiency was 74%, the results in both 6th and 12th month visits had confirmed that the connective tissue graft covering the tooth root were in harmony with the soft tissue around and stuck to the surface of the tooth root at the cement and tooth dentin portions (in most cases we ground the root surface to reduce the curvature of the root surface and exposed dentin). The graft could attach to the cervical erosion also.

The rate of re-covering 100% root surface:

This ratio is also a criterion for evaluating the effectiveness of surgical procedures. At examination of times after surgery (Table 3.16), the rate of fully covering of root surface were generally 71% or more in the postoperative following-up times of 3rd, 6th, 12th month and did not differ significantly between the times. This is the first study we did connective tissue grafts covering the tooth root, most of the cases covering 100% of root surfaces were at the second half-time of the study so we believe that this is a highly effective surgery with experience surgeon. A number of foreign researchers reported that the rate of recovering the root surface completely were quite high, for example, RJ Harris. [77] in 2003 treated 50 teeth, 29 tooth roots (58%) were recovered 100%.

The change of keratinized gingiva after surgery:

The keratinized gingiva width counts from gingival margin to muco-gingival junction, gingival recession reduced the size of keratinized gingiva, even no gingiva left, in this case the mucosa edge was pulled during chewing

enabling bacteria getting into the sulcus leading to symptoms of inflammation. Connective tissue grafts are highly effective in restoring keratinized gingiva. According to table 3.21: In our study, at the 12th month visit: the average of keratinized gingiva width was 4.1 mm compared with 2.4 mm before surgery, this difference was statistically significant with p <0.01. Compared to the findings of other authors: Alkan EA [80] in 2011 reported the result after 1 year following-up of 16 transplants in Ankara, the average of keratinized gingiva width increased 2.4 mm; Cairo F [70] and his colleagues in 2008 informed the results of a study of connective tissue graft, the average of keratinized gingiva width increased 1.3 mm; Hiral [87] et al: the average of keratinized gingiva width increased from 2.5 mm to 3.3 mm at 6th month follow-up. Pierpaolo Cortellini [88] and his colleagues in 2012 reported the results after one year: keratinized gingiva width increased 3 mm on average, which the author emphasized that he did not move the flap toward the cervix when sewed graft and flap. Other studies have also concluded that the keratinized gingiva width increased after surgery [80], [68], [89], [90], [82].

The change of probing depth after surgery:

Probing depth and the size of keratinized gingiva are important indicators to evaluate the adhesion of the graft and flap on the surface of the tooth root, which evaluate the effectiveness of the connective tissue graft method recovering the tooth root surface. If the connective tissue graft was not stuck to the tooth root surface, the surgery can not be considered successful, this will increase the probing depth (inducing gingival pocket). In this study the probing depth was measured at the mid-point of the labial gingival margin.

Based on table 3.21: the average probing depth decreased significantly at 6th month visit (1mm) compared with preoperative (1.2 mm) ($p < 0.01$). The probing depth at post surgery visits did not change significantly. Some authors reported research results: probing depth was significantly reduced after surgery as Ahathya RS [27], Arthur B [92], Aroca S [68], Elizabeth [89], Hiral M [84]. Some authors reported probing depth did not change or changed not significantly after surgery as Cairo F 2008 [70], Christine Romagna [76], Haim Tal [74], Michele Paolantonio [64].

According to our experience, there are many factors affecting the probing depth after surgery: tooth root surface is cleaned of bacteria and exogenous factors or not, root surfaces conditioned or not, gum in the healing process is injured by trauma or solid food or toothbrush that detaches the gingiva from tooth surface or not. Chronic gingivitis occurs after surgery makes probing depth increase.

CONCLUSION

1. CLINICAL FEATURES OF GINGIVAL RECESSION CASES:

-The average age of patients was 34.9.

-Women involved more in surgery than men, the rate is nearly twice that of men.

-Rate of good oral hygiene at 12th post-surgery was significant higher than that at pre-surgery ($p > 0,05$).

-The rate of upper teeth operated was higher than that of lower teeth in both sexes ($p > 0,05$). Premolar teeth proportion war the highest.

2. SURGERY OUTCOMES:

- Connective tissue grafts recovering the exposed tooth root surface was a safe surgery.

- Connective tissue grafts recovering the exposed tooth root surgery was highly effective, at 1 year after surgery, the rate of high effectiveness was 74%, the rate of fair effectiveness was 14% and the rate of bad effectiveness was 12%.

- The average of recovering the vertically tooth root surface in the first year ranged from 2.6 ± 1.4 mm to 2.7 ± 1.4 mm equivalent to an average of 84.6% to 86.9%. Postoperative results differed significantly from that at pre-surgery ($p < 0.01$), no statistical difference at the time of 1^{st}, 3^{rd}, 6^{th} and 12^{th} visits.

- More than 71% of the tooth root surfaces were completely recovered in the examinations of post-surgery.

- Gingival recession height reduced significantly after surgery ($p < 0.01$. Between the postoperative visits the gingival recession height differences were not statistically significant ($p > 0.05$).

- Gingival recession width reduced significantly after surgery ($p < 0.01$; between the post-surgery visits the gingival recession width differences were not statistically significant ($p > 0.05$).

- Attached gingiva width increased significantly after; between postoperative visits the index of attached gingiva changed without statistical significance.

- Probing depth changed significantly from pre-surgery to post-surgery. The probing depths of 6^{th} and 12^{th} post-surgery changed without significant difference.

- Keratinized gingival width increased significantly after. Between the visits the keratinized gingiva width changed without statistical difference.

-The loss of attachment was decreased significantly after. The loss of attachment changed without significant difference between the post-surgery visits.

- The results of two surgical procedures were equal.

- The size of attached gingiva and keratinized gingiva increased relatively with the degree of vertically recovering the tooth root surfaces.
- The Miller 1 and Miller 2 group's surgical results were similar.

PROPOSALS

- Increase treatment application of connective tissue grafting to cover denuded root surface.

- Do further study with more subjects and longer follow-up period of time to assess long-term results of the method.

LIST OF AUTHORS' PUBLISHED STUDIES THAT RELATED TO THE THESIS

1. Le Long Nghia, Nguyen Manh Ha, Truong Manh Dung, Trinh Thi Thai Ha (2013): The changes of the gingival index after the subepithelial connective tissue graft treating denuded tooth root surface. *Journal of Medical Practice*. **864**, 136-139.

2. **Le Long Nghia, Nguyen Manh Ha, Truong Manh Dung, Trinh Thi Thai Ha (2013):** The results of subepithelial connective tissue graft surgery for recovering the tooth root surface on a group of patients. *Journal of Medicine and Pharmacy Information.***3**, 33-36.