

Thickness of Masticatory Mucosa in the Human Hard Palate and Tuberosity Dependent on Gender and Body Mass Index

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ABSTRACT

The aim of this study was to clinically determine the thickness of masticatory mucosa in the hard palate and tuberosity as potential donor sites for subepithelial grafts for ridge augmentation procedures of small and moderate alveolar ridge defects to improve aesthetics of a pontic area of fixed partial dentures. In 102 periodontally healthy fully dentate subjects the thickness of mucosa was assessed by bone sounding with a periodontal probe. Twenty measurement points were defined, 18 on hard palate located on 3 lines running at different distances parallel to gingival margin and 2 on tuberosity. Data were analysed to determine differences between gender and different body mass index using t-test. The mucosa on the hard palate was significantly thicker than on the tuberosity. The thickest mucosa was registered on the second and the third line behind canines and on all 3 lines behind the first premolar. These areas are recommended as potential donor sites. Males had significantly thicker mucosa than females ($p < 0.01$), except for the sites behind the first molar ($p > 0.05$) where the mucosa was the thinnest in the both gender, which was attributed to the protuberance of the palatal root of the first molar. The same was with the body mass index. Therefore canine-premolar palatal region is recommended for harvesting free subepithelial grafts for moderate augmentation of alveolar ridges for achieving optimal aesthetics of the pontic area.

Key words: hard palate mucosa thickness, free subepithelial graft, alveolar ridge augmentation, localised defects, gender, body mass index

Introduction

Aesthetically correct treatment with fixed partial dentures can be overcome not only by a variety of prosthetic means, but also by several surgical techniques, notably soft tissue augmentation. Treatment of localized alveolar ridge defects is an important mucogingival aesthetic challenge. Pleasing aesthetic appearance is almost the most important factor for a patient¹⁻⁷.

Advances in the field of restorative materials allow a lost tooth to be replaced by artificial tooth structure that is virtually indiscernible from the original⁸⁻¹⁶. The standards for the pontic area and the adjacent soft tissue in the maxillary anterior region have, however increased in particular. Unaesthetic mucogingival texture and »black« interdental spaces are often seen in the pontic area without prior surgical treatment of localized defect of alveolar ridges. Alveolar ridge defects could be com-

pensated by modification of the pontics design and color, but prosthetic methods are not always satisfactory.

In most cases, simple surgical procedures of augmentation of localized alveolar ridge defects with mucosal grafts from hard palate or tuberosity are enough to overcome aesthetical requirements^{17,18}.

Different classification of alveolar ridge defects are used¹⁷⁻²² and the simplest one for the clinical purposes is the Studer's and Schärer's classification¹⁷ considering separately both, vertical and horizontal resorption. They recommend free subepithelial graft for the treatment of defects less than 6 mm.

The aim of this study was to clinically determine the thickness of masticatory mucosa in the hard palate and tuberosity as potential donor sites for subepithelial graft for minor or moderate ridge augmentation procedures

which improve aesthetics of the pontic area of fixed partial dentures. The aim was also to analyze the hard palate mucosal thickness in individuals of different body mass index and different gender.

Patients and Methods

In 102 healthy fully dentate subjects (20 to 49 years old) the masticatory thickness was assessed by bone sounding with a periodontal probe. Twenty measurement points were defined, 18 on hard palate located on 3 lines running at different distances parallel to gingival margin (3 mm, 7 mm, 11 mm) and 2 on tuberosity located distally from the third molar (Figure 1). There were 42 men and 60 women. Sixty three of them had body mass index >0.22 kg/cm² and 39 had body mass index <0.22 kg/cm². The inclusion criteria were periodontal health, no prosthetic appliances, healthy mucosa and no drugs intake which could influence the volume of mucosa, no alcohol abuse and no smoking habits. The hard palate and tuberosity were anesthetized by Xylestestin spray (Espe, Seefeld, Germany) prior bone sounding. Data were analyzed using SPSS 10/1 for Windows (SPSS Inc., Chicago, Illinois), by descriptive statistics, Kolmogorov-Smirnov test and t-test for independent samples.

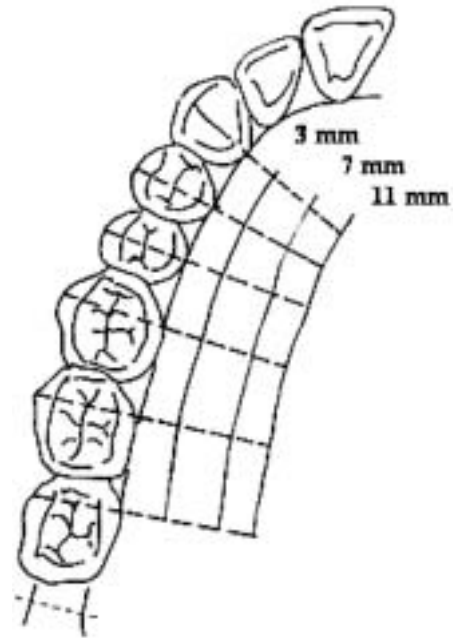


Fig. 1. Measurement points, 18 on hard palate located on 3 lines running at different distances parallel to gingival margin (3 mm, 7 mm, 11 mm) and 2 points on tuberosity located distally from

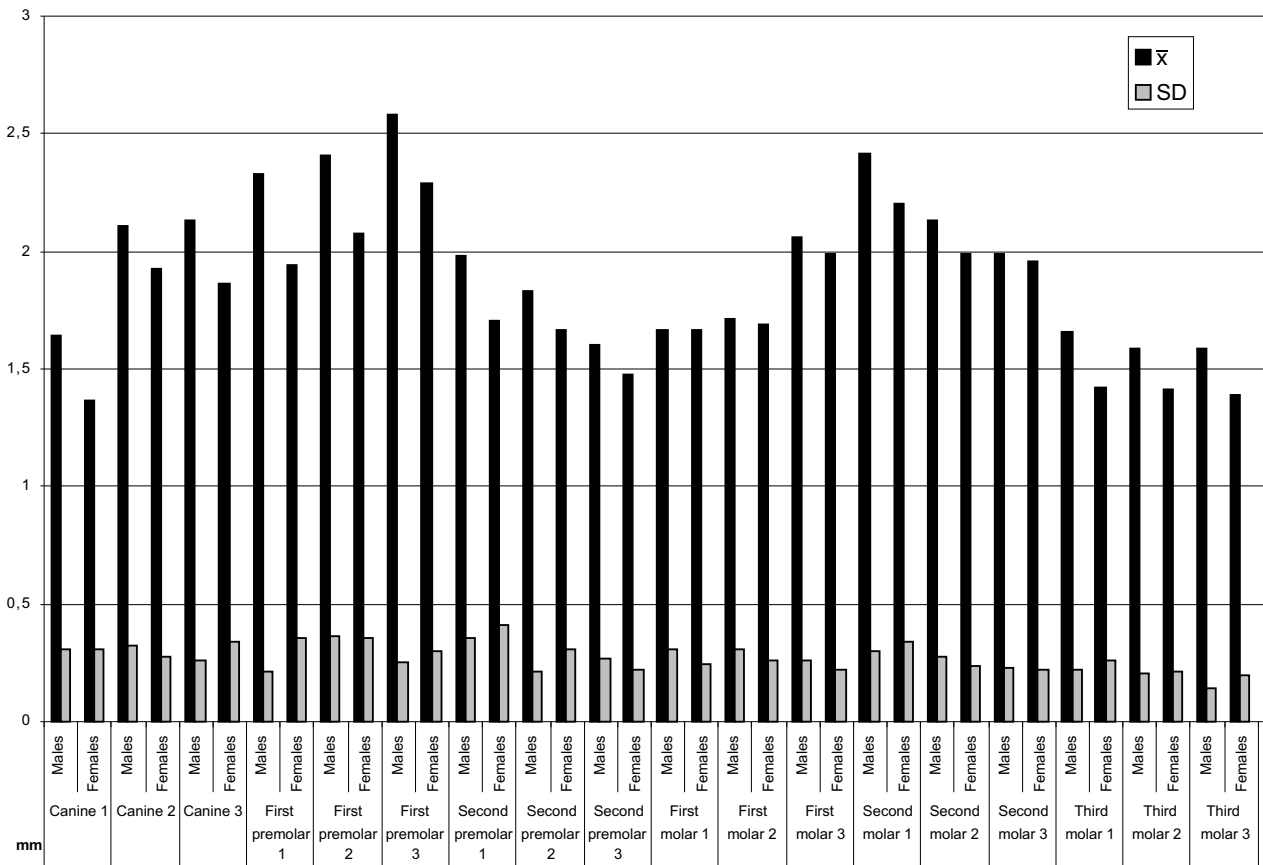


Fig. 2. The thickness of hard palate and tuberosity mucosa in males and females.

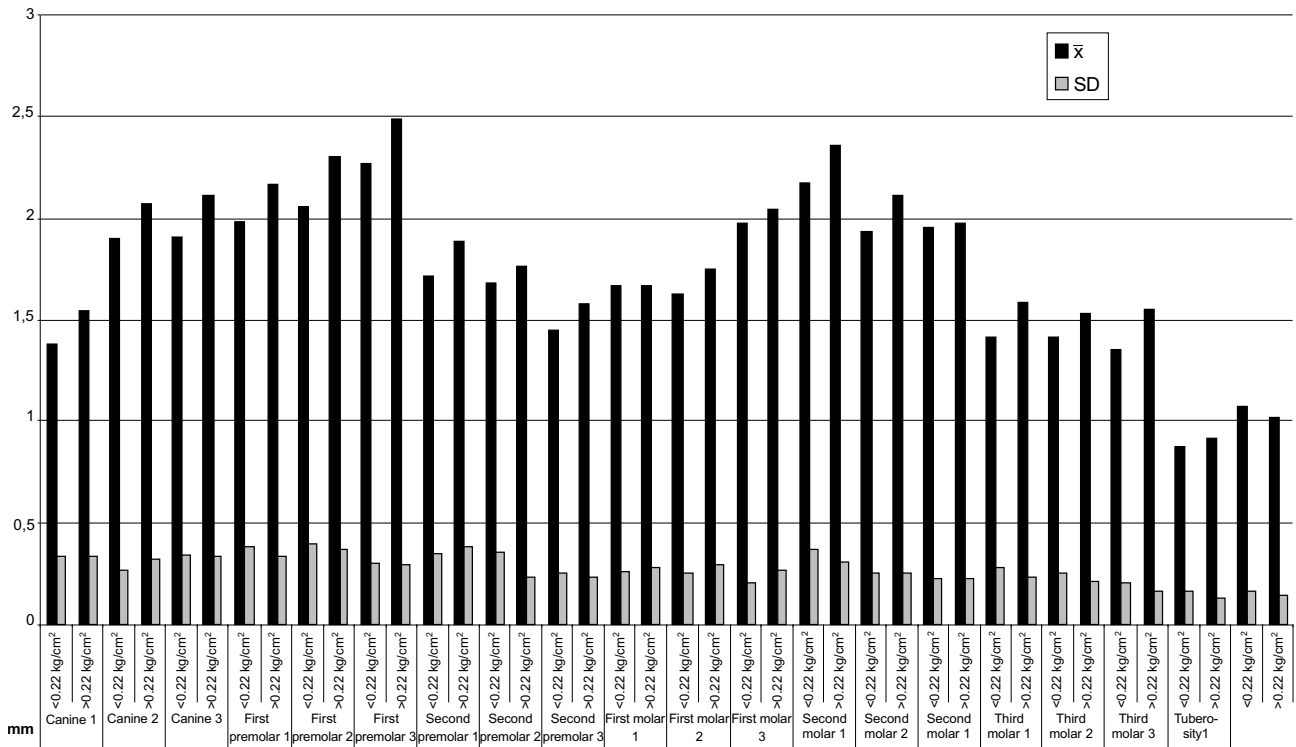


Fig. 3. The thickness of hard palate and tuberosity mucosa in individuals with different body mass index.

Results and Discussion

To achieve better aesthetics of a pontic area of fixed partial dentures, sometimes minor or moderate local alveolar ridge defects could be successfully solved by simple surgical procedures of augmentation with mucosal subepithelial grafts from hard palate or tuberosity^{17–22}. As the hard palate and tuberosity are potential donor sites for subepithelial graft harvesting, we analysed the mucosal thickness in individuals of different body mass index and different gender. The results of the thickness of the mucosa of the hard palate and tuberosity in different gender are presented in the Figure 2, and the results of individuals of different body mass index (<22 kg/cm², >22kg/cm²) are presented in the Figure 3. Kolmogorov-Smirnov test revealed the normality of the distribution (p>0.05). T-test for dependent samples revealed no statistically significant differences between the left and the right side for the mucosa thickness of the hard palate or tuberosity. So far, the statistical analysis was performed for the values obtained by measurements on the right side.

Both, in males and females the thickest mucosa was measured in the hard palate and the thinnest mucosa on the tuberosity. In the hard palate, mucosa thickness increased with greater distances from the marginal gingiva in the canine and the first premolar region, but not in the region of the second premolar and the first molar, the second molar and the third molar (Figure 2). The thinnest mucosa in the hard palate was measured

in the first molar region in both gender, which was attributed to the protuberance of the palatal root of the first molar. Individuals of different body mass index also had the thinnest mucosa in the region of the second premolar and the first molar. Mucosa thickness increased with greater distances from the marginal gingiva in the canine and the first premolar region (Figures 2 and 3).

Significance of the difference between different gender and between individuals of different body mass index was assessed by independent t test and is presented in the Table 1. The mucosa was significantly thicker in males than in females in all regions, except for the first molar region and tuberosity, and similar results were obtained for the individuals of higher body mass index (p<0.05, Table 1).

Studer at al.²³ found mucosa on tuberosity significantly thicker than in the hard palate, which is opposite from our study. The difference could be for the reason that our sample had the third molar erupted and the sample of the mentioned study had the last second molar tooth. Their values for the thickness of mucosa were higher (2.5–3.9 mm) than ours (2.0–2.8 mm), which could be attributed to the fact that they injected local anesthetic which could increase the volume of mucosa and we used spray only. They also had the smaller sample.

Studer at al.²³ found no significant difference between gender, which is also in disagreement with our results and the results of Öslund²⁴, who studied the thickness of palatal mucosa in edentulous subjects by biopsies.

TABLE 1
 BODY MASS INDEX (>0.22 kg/cm²=39, >0.22 kg/cm²=63); GENDER (MALES=42, FEMALES=60)

	Gender		Body mass index	
	t	p	t	p
Canine 1	4.377	<0.01**	-2.409	0.018*
Canine 2	2.961	<0.01**	-2.723	0.008**
Canine 3	4.333	<0.01**	-1.980	0.048*
First premolar 1	6.242	<0.01**	-2.646	0.009**
First premolar 2	4.525	<0.01**	-3.321	0.001**
First premolar 3	5.206	<0.01**	-3.709	0.000**
Second premolar 1	3.477	<0.01**	-1.990	0.047*
Second premolar 2	2.952	<0.01**	-1.980	0.049*
Second premolar 3	2.456	<0.05*	-2.563	0.012*
First molar 1	-0.087	0.931 NS	-0.018	0.986 NS
First molar 2	0.345	0.731 NS	-1.921	0.054 NS
First molar 3	1.306	0.195 NS	-1.484	0.141 NS
Second molar 1	3.135	<0.01**	-2.476	0.015*
Second molar 2	2.538	<0.01**	-3.185	0.002**
Second molar 3	0.753	0.453 NS	-0.376	0.708 NS
Third molar 1	4.557	<0.01**	-2.959	0.004**
Third molar 2	4.008	<0.01**	-2.312	0.023*
Third molar 3	5.316	<0.01**	-5.106	0.001**
Tuberosity 1	1.485	0.141 NS	-1.238	0.219 NS
Tuberosity 2	-0.618	0.538 NS	1.695	0.094 NS

t = t value, p = level of significance; <0.01** = significant at 99% level of probability, <0.05* = significant at 95% level of probability, NS = not significant; Degrees of freedom=100

Although assessment of the mucosa thickness in the hard palate and tuberosity is also available by some ultrasonic devices^{25–27}, the authors measuring with the above mentioned technique did not make comparison with bone sounding technique and reported results from a small sample²⁷. Ultrasonic devices need a lot of knowledge for interpretation and are still expensive for everyday practice, so simple bone sounding with a probe is still a method of choice.

Except for the thinnest values of mucosa thickness in the first molar region and tuberosity, these sites also represent the anatomical barrier in tissue harvesting.

We therefore recommend mucosa in hard palate behind the first premolar and canine for wide and shallow graft harvesting.

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DEBLJINA SLUZNICE TVRDOG NEPCA I TUBERA MAKSILE OVISNO O SPOLU I INDEKSU MASE TIJELA

S A Ž E T A K

Svrha ovog istraživanja bila je klinički odrediti debljinu mastikatorne sluznice na tvrdom nepcu i na tuberima maksile kao potencijalnim mjestima za uzimanje slobodnog subepitelnog tkiva zbog rješavanja lokalnih manjih ili umjerenih defekata alveolarnog grebena (povećanja grebena) kako bi se postigla optimalna estetika u području međučlanova mosta. Sudjelovala su 102 parodontno zdrava potpuno ozubljena ispitanika, a debljina sluznice mjerena je pomoću zaobljene parodontne sonde. Definirano je 20 mjernih točaka, 18 na tvrdom nepcu, (5 točaka na 3 paralelne linije različito udaljene od gingivnog ruba, od očnjaka do trećeg molara) i 2 točke na tuberima. Podaci su statistički analizirani (t-test) kako bi se odredila značajnost razlike između spolova i različitih indeksa mase tijela. Sluznica na tvrdom nepcu bila je značajno deblja nego na tuberima ($p < 0,01$). Najveća debljina mukoze registrirana je na drugoj i trećoj liniji iza ruba gingive očnjaka i na trima linijama iza ruba gingive prvog premolara, te se ta mjesta predlažu kao potencijalna donorska mjesta. Muški ispitanici imaju značajno deblju mukožu od žena ($p < 0,01$), osim za područje iza prvog molara gdje je zabilježena najtanja sluznica u oba spola ($p > 0,05$), što je protumačeno protuberancijom palatinalnog korijena prvog molara. Isti rezultati dobiveni su i kod različitog indeksa mase tijela. Stoga se područje nepca iza kanina i premolara preporučuje za uzimanje tkiva za slobodni subepitelni autotransplantat kod manjih i umjerenih povećanja alveolarnog grebena u području međučlanova mosta za dobivanje optimalne estetike.