MEASUREMENT OF THE GINGIVOBUCCAL SULCUS WIDTH IN EDENTULOUS MAXILLA

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ABSTRACT

Background: Edentulism is a widespread problem. For the stability of complete dentures, the proper functional impression is the important stage. The determination of the borders of the prosthetic field is influenced by muscle movements and the level of their grip.

Purpose: The aim is to determine the mean value of the gingivobuccal sulcus width for an edentulous upper jaw.

Material and methods: The study was performed on gypsum patterns, cast from functional upper jaw impressions. 154 work models were measured, of which 122 are subject to statistical processing. 10 measurements were taken in specific symmetrical zones: Spina nasalis anterior, two-sided from Frenulum labii superioris; canine area; the area of Processus zygomaticus; vestibular from Tuber maxillae; the space behind Tuber maxillae.

Results and discussion: Data from symmetric areas were analyzed using the statistical processing and "R" programming language, *F-test* for equality of variance and *t-test* for comparison group means.
The biggest average value was found in the canine area - 2.12 mm to the right and 2.16 mm to the left side; the smallest mean value was in the space behind Tuber maxillae - 1.53 mm on both sides.

Key words: gingivobuccal sulcus, maxilla, edentulism.

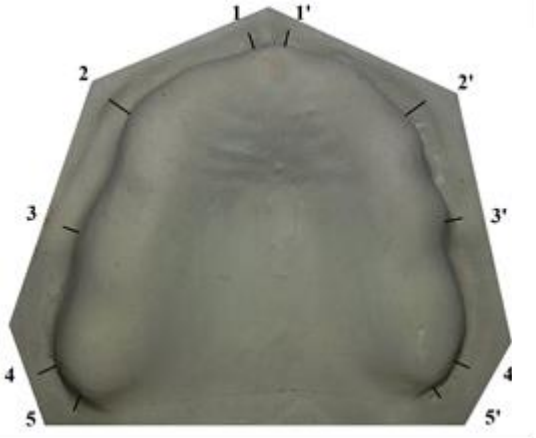
INTRODUCTION: Applying the functional impression technique reduces the deformation of the alveolar ridge and the border soft tissues, resulting in increased retention and stability. Mucostatic methods lead to an inadequate impression and in many cases cause failure (1). In the case of shortened treatment without final functional impression, there was a statistically significant difference in the number of visits and the number of decubitus ulcers after the insertion of the complete dentures (2).

Significance for the correct impression of the gingivobuccal sulcus has not only its depth but also its width, which is often underestimated (3). Determination of the boundaries of the prosthetic field is influenced by anatomical structures - muscles (4, 5, 6), muscular and soft tissue gripping (7, 8). In the distal region, the buccal sulcus is located in the paratuberal space to facies infratemporalis maxillae. Herbst test for functional impression technique are used the most widely (9). According to literature, the widest zone of gingivobuccal sulcus is paratuberally, and also in the area of the canine, the narrowest - around frenulum labii superioris and gingival-buccal connections (6). In a comparative study, it was found that the force required to detach a denture made with functional and non-functional impression technique was 53% greater (10). The accuracy of the impression depends also of the type of an impression material, not only of an impression technique (11, 12, 13).

An asymmetry is found between the left and right parts of the upper and lower jaws (14, 15). N. Popov (1970) constructed an additional device for the "Panoramix" X-ray apparatus and developed a method for obtaining and examining isometric X-ray images of the contour of the gingivobuccal sulcus and the top of the alveolar ridges by radiographing, taken radiopaque impression materials (16, 17) .

PURPOSE: Determination the mean value of the gingivobuccal sulcus width for an edentulous maxilla.

MATERIAL AND METHODS: The study was performed on gypsum patterns, cast from functional upper jaw impressions. It was used Herbst functional tests and C-type of silicon (low viscosity). 154 work models were measured, of which 122 are subject to statistical processing. From each model, 10 measurements were taken in specific symmetrical zones (fig. 1):



Legend to fig. 1:

1 - Spina nasalis anterior dextra (SNA)
1' - Spina nasalis anterior sinistra (SNA)
2 - Spacies dens caninus dextra (SDC)
2' - Spacies dens caninus sinistra (SDC)
3 - Processus zygomaticus dexter (PZ)
3'- Processus zygomaticus sinister (PZ)
4 - Tuber maxillae dexter (TM)
4' - Tuber maxillae sinister (TM)
5 – Spacies posttuberalis dextra (SPT)
5' – Spacies posttuberalis sinistra (SPT)

Fig. 1. Plaster model Frasaco with measurement marks

It was used *Electronic digital caliper* 0-150 mm. The results were statistical analyzed by *F-test* and *t-test*, and the study was visualized by *Microsoft Office Excel 2010.*

RESULTS: Measured data is given in a table (table 1):

Table. 1. Measured values in specific zones of the upper jaw illustrated in fig.1

Specific measurement zone / Plaster model №	1	1'	2	2'	3	3'	4	4'	5	5'
model 1	2,01	1,74	1,86	1,95	1,61	1,85	1,63	1,82	1,45	1,42
model 2	2,26	2,31	2,43	2,04	2,16	1,85	2,68	2,29	1,75	1,41
model 3	2,31	2,08	2,01	1,94	2,09	2,08	1,81	1,91	1,89	1,84
model 4	2,09	1,88	2,08	2,23	1,53	1,57	1,51	1,91	1,38	1,33
model 5	1,85	1,79	2,09	2,05	1,92	1,69	1,82	1,71	1,36	1,48
model 6	1,49	1,54	1,28	1,37	1,63	1,61	1,39	1,79	1,71	1,61
model ...	...	...	...	...	...	...	...	...	...	...
model 154	2,34	2,19	2,11	2,08	1,93	1,82	1,96	1,85	1,26	1,38

Initial data from the symmetrical areas were gathered in pairs – (SNA dex. - SNA sin), (SDC dex. - SDC sin.), (PZ dex. - PZ sin.), (TM dex. - TM sin.), (SPT dex. - SPT sin.) and analyzed by *"R" programming language* and software environment for statistical computing. The purpose of the analysis was to detect statistically significant differences between the group means.Consistently were applied *F-test* for equality of variance and *t-test* for comparison group means (Table 2). It was not found a statistically significant difference between the group means.

Table 2. Results from F-test u t-test

Tests / Specific comparative zones	F-test	t-test
SNA dex.-SNA sin.	F = 1.2683, p-value = 0.1926	t = -1.5028, p-value = 0.1342
SDC dex.-SDC sin.	F = 1.0576, p-value = 0.7584	t = -1.3812, p-value = 0.1685
PZ dex.-PZ sin.	F = 0.7511, p-value = 0.1167	t = 0.2581, p-value = 0.7965
TM dex.-TM sin.	F = 2.2301, p-value = 1.391e-05	t = -1.4257, p-value = 0.1554
SPT dex.-SPT sin.	F = 1.2997, p-value = 0.1508	t = 0.1271, p-value = 0.899

The Range is defined as the difference between the maximum and minimum observations, and gives an estimate of the spread of the data. It was highest in TM zone, followed by SPT. The smallest amplitude was established in the SDC, PZ and without difference was in SNA. In addition, the standard deviation is a measure of the spread of the data around the mean.The estimated value of standard deviation (sd) was 0,23/0,16 in TM zone. The insignificant values were in the other areas –

0,24/0,21 при SNA, 0,23/0,22 при SDC, 0,17/0,19 при PZ, 0,14/0,12 при SPT (Table 3).

Table 3. Statistical descriptive parameters

Reference marks / parameter	*SNA*		*SDC*		*PZ*		*TM*		*SPT*	
	dex.	*sin.*	*dex.*	*sin.*	*dex.*	*sin.*	*dex.*	*sin.*	*dex.*	*sin.*
Mean	2,01	2,05	2,12	2,16	1,99	1,98	1,88	1,91	1,53	1,53
Sd	0,24	0,21	0,23	0,22	0,17	0,19	0,23	0,16	0,14	0,12
Max	2,36	2,45	2,45	2,52	2,35	2,36	2,68	2,33	2,08	2,01
Min	1,45	1,54	1,28	1,37	1,53	1,55	1,39	1,71	1,26	1,33
Range	0,91	0,91	1,17	1,15	0,82	0,81	1,29	0,62	0,82	0,68

DISCUSSION: From the results, outlined in Table 2 and 3, we establish that a statistically significant difference was *not found*. The greatest fluctuations are observed in the area of the Tuber maxillae. The visualization of the percentage is presented in Diagram 1.

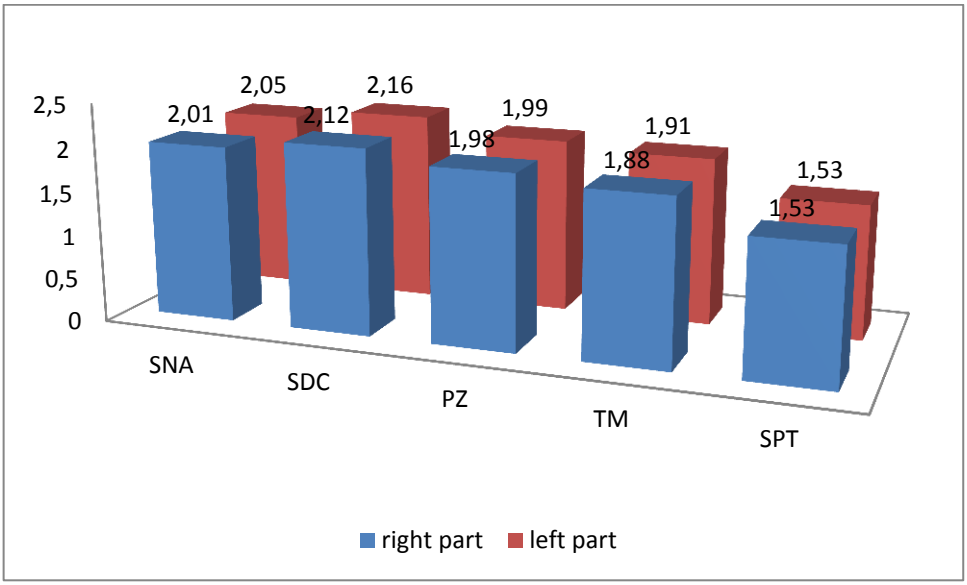


Diagram 1.
Comparative graphics between the mean values of left and right symmetric region

The results confirm that the gingivobuccal sulcus is the widest of the canine area, but it is not in paratuberal space (6). The greatest extent is influenced by the soft tissue profile of the zone (4, 5, 6, 7, 8). The asymmetry found by us confirms the thesis of other authors (14, 15). The resulting gingivobuccal sulcusgrams under the N. Popov's method, give extensive information at rest or function, illustrating the

contour of the gingivobuccal sulcus and the inclinations of the buccal and the labial frenulums. They allow sector analysis and addition of several graphs of the same patient (16, 17).

CONCLUSION: The width of the gingivobuccal sulcus varies within a small interval - from 1.53 mm to 2.16 mm. The widest is in the canine area, the narrowest is behind the maxillary tuber, as in the case of non-retentive and refined tuber is missing. An asymmetry is observed between the right and left half of the upper jaw.

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