

Distribution of Posterior Tooth Contacts in Centric Occlusion

Raspodjela dodira stražnjih zuba u centralnoj okluziji

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Summary

The occlusal tooth contacts in maximum intercuspitation (centric occlusion) were analyzed in 74 subjects, aged 16 to 19, with complete natural eugnathic dentitions. Using articulation paper, 39.76 marks were determined on the posterior teeth of both jaws. In regard to the sagittal plane, a symmetry of equal number of tooth contacts on the left and right side was observed. In females, the number of occlusal contacts was statistically greater than the number of contacts in males. The greatest number of occlusal marks in centric occlusion was found in the region of the first and second molars. The distribution and frequency of contacts at occlusal surfaces of all posterior teeth are also described.

Key words: *centric occlusion, tooth contacts*

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Introduction

Understanding the nature of the intercuspitation of the teeth in the maximum intercuspitation position (centric occlusion) is necessary for the practice of restorative dentistry. Intercuspitation of the teeth is one of the factors responsible for maintaining the correct position of the teeth. Changes in occlusal anatomy at the time restorations are made may result in movement of involved teeth to a new position of equilibrium (1). The intercuspital position is selected by the central nervous system based on the

number and distribution of occlusal contacts, which on the other hand provide the neuromuscular system with feedback (2). The number of occlusal contacts in the maximum intercuspital position in adult natural dentition varies intraindividually depending on head posture, the pressure applied during closure, the time of day or the specific day when the registration takes place, and on the individual's neuromuscular environment (2,3).

To identify tooth contacts, qualitative and quantitative methods can be used. The qualitative methods involve the use of marking papers,

occlusal waxes, silicone impressions, or combinations of these materials to identify the presence of contacts. Quantitative methods are photo-occlusion, which describes contact intensities, and the T-Scan system, which describes the timing and force characteristics of tooth contacts (4, 5, 6).

The aim of this study was to describe the occlusal contacts in natural adult dentition in the maximum intercuspitation position (centric occlusion) with a method that can be used in daily practice. The distribution and frequency of contacts at occlusal surfaces of posterior teeth are described, so that they can be imitated in prosthetic dentistry.

Materials and Methods

For the present study, 74 subjects aged 16 to 19 years were selected among nursing trainees at Zdravstveno Obrazovni Centar Zagreb. They all had Angle Class I occlusion, few restorations and no missing teeth (except third molars). To standardize the procedures, all occlusal records were made between 9:00 and 12:00

a.m., in the same dental chair, with the same head position, and by the same examiner. The procedure was repeated twice for each subject.

The contacts of the teeth in the maximum intercuspitation position (centric occlusion) were determined by the use of marking papers. The articulating paper marks on maxillary and mandibular teeth were copied in the special form made for this study on the model of a diagnostic list after Krogh-Poulsen (7). Former studies prove that very often there are no contacts between the front teeth in the maximum intercuspitation position (2, 8) – that is why only the posterior teeth were evaluated. Encoding registered marks on occlusal surfaces of posterior teeth of both jaws are shown in Figure 1.

Results

Statistic analysis of the results showed that there were about 40 occlusal position marks (20 contacts) on maxillary and mandibular teeth in maximal intercuspitation. The last number of registered occlusal marks was 20, whereas there

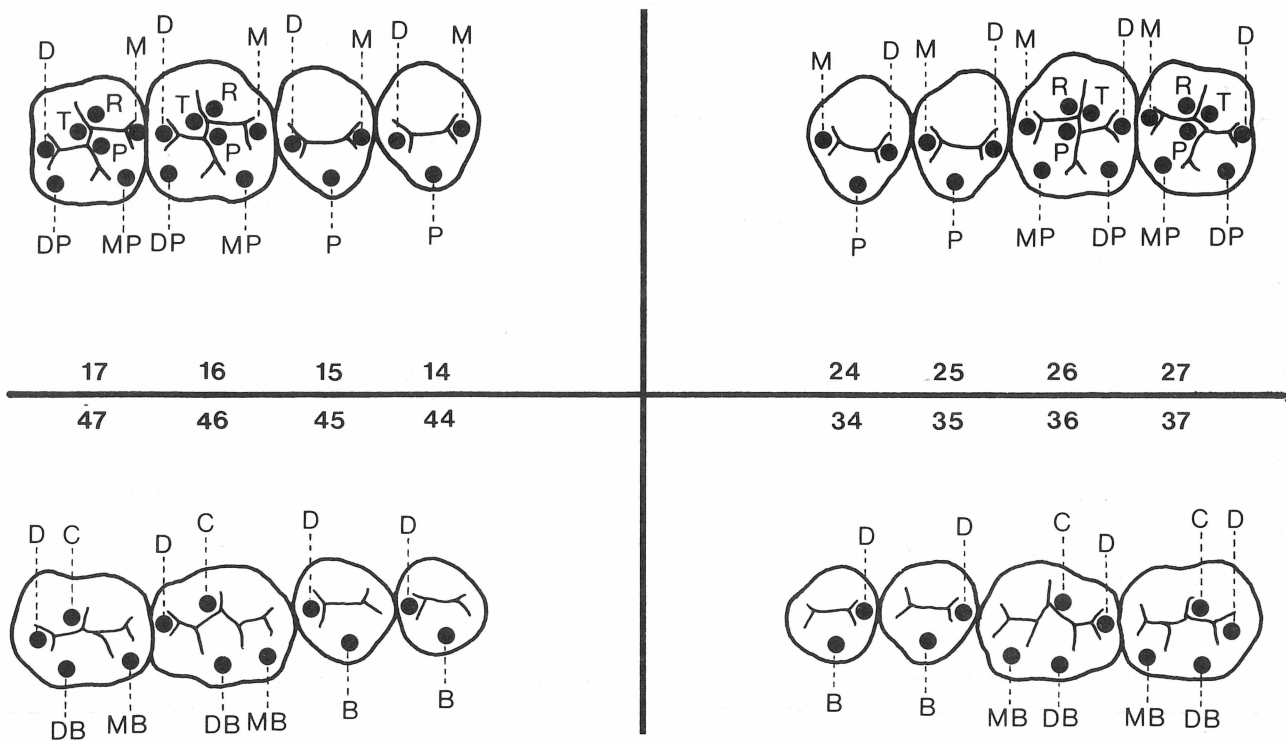


Figure 1. Encoding registered marks on occlusal surfaces of posterior teeth
 Slika 1. Kodiranje registriranih dodira na okluzijskim plohama stražnjih zuba

were 54 teeth contacts of both jaws in one patient (Table 1). Division of the individuals of this study according to sex showed significant differences in the number of tooth contact in

the maximum intercuspitation position. In female subjects, there were six occlusal marks (three contacts) more than in the males (Table 2).

Table 1. The number of contact areas in centric occlusion

Tablica 1. Prosječan broj okluzijskih dodira po ispitaniku pri maksimalnoj interkuspilaciji (centralnoj okluziji)

	\bar{x}	S.D.	Minimum	Maximum	n
Mandible	19.74	3.531	10	26	74
Maxilla	20.12	3.857	10	27	74
Both	39.86	7.29	20	54	74

Table 2. The number of contact areas in centric occlusion on male and female teeth

Tablica 2. Prosječan broj okluzijskih dodira na obje čeljusti po ispitaniku – razlike prema spolu

	\bar{x}	S.D.	n	
Male	36.3103	6.205	29	$t = -3.74$ d.f. = 65 $P < 0.01$
Female	42.1556	7.068	45	

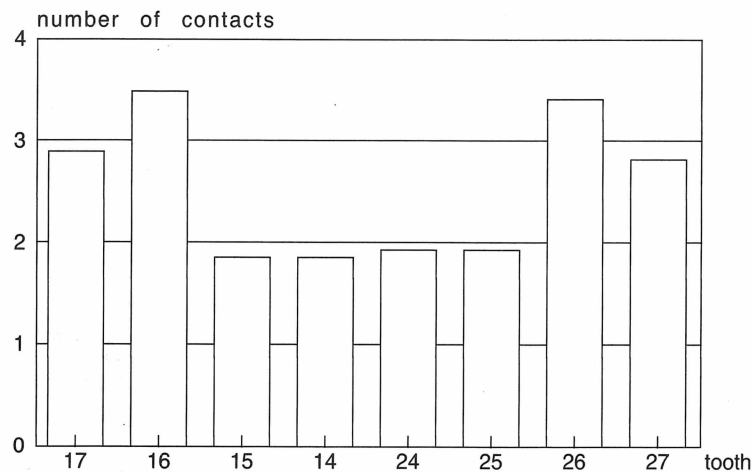


Figure 2. The average number of occlusal contacts on maxillary teeth

Slika 2. Prosječan broj okluzijskih dodira na zubima gornje čeljusti

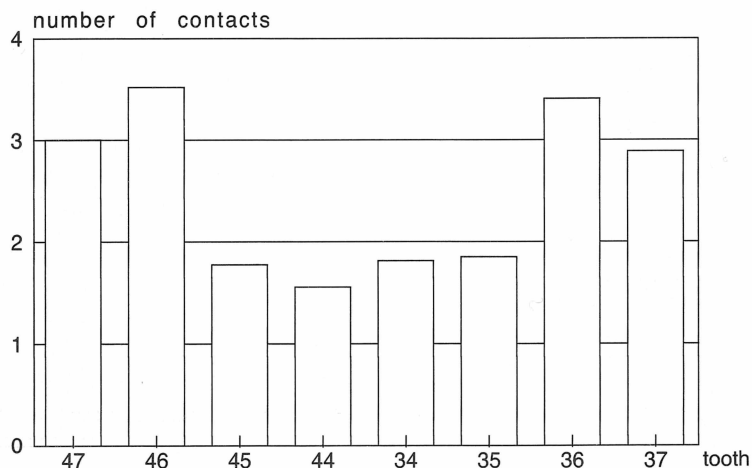


Figure 3. The average number of occlusal contacts on mandibular teeth

Slika 3. Prosječan broj okluzijskih dodira na zubima donje čeljusti

● – 75–100 of analyzed sample ○ – 50–75% of analyzed sample

Figures 2 and 3 show the average number of occlusal marks on each tooth. The greatest number of occlusal marks on the maxillary as well as mandibular teeth in maximum intercuspitation (centric occlusion) was found on the surface of the first molar, then the second molar. On premolars, there were usually less than two contacts. The T-test showed that there was no statistically significant difference in the number of contacts between the right and left sides.

Table 3. *The number of contact areas in centric occlusion on the occlusal surfaces of the maxillary teeth (n = 74)*

Tablica 3. *Prosječan broj dodira po okluzijskoj plohi zuba gornje čeljusti (n = 74)*

Surface	\bar{x}	S. D.	Surface	\bar{x}	S. D.
D17	.07	.25	M27	.38	.49
T17	.31	.47	T27	.41	.49
R17	.54	.50	R27	.46	.50
P17	.03	.16	P27	.03	.16
M17	.41	.49	D27	.09	.29
DP17	.64	.48	MP27	.82	.38
MP17	.92	.27	DP27	.61	.49
D16	.20	.40	M26	.51	.50
T16	.43	.50	T26	.46	.50
R16	.58	.50	R26	.54	.50
P16	.05	.23	P26	.01	.12
M16	.46	.50	D26	.22	.41
DP16	.76	.43	MP26	.88	.33
MP16	.97	.16	DP26	.78	.41
D15	.23	.42	M25	.45	.50
V15	.27	.45	V25	.31	.47
M15	.39	.49	D29	.24	.43
P15	.95	.23	P25	.91	.29
D14	.22	.41	M24	.49	.50
V14	.32	.47	V24	.34	.48
M14	.41	.49	D24	.19	.39
P14	.93	.25	P24	.92	.27

In Tables 3 and 4, the mean number of occlusal marks on the analyzed surface of each tooth is shown. Figure 4 shows the occlusal marks that are expected in a normal adult dentition. The frequencies of contacts were between 50-75% or 75-100% in the analyzed sample.

Table 4. *The number of contact areas in centric occlusion on the occlusal surfaces of the mandibular teeth (n = 74)*

Tablica 4. *Prosječan broj dodira po okluzijskoj plohi zuba donje čeljusti (n = 74)*

Surface	\bar{x}	S. D.	Surface	\bar{x}	S. D.
D47	.38	.49	M37	.31	.47
C47	.76	.46	C37	.57	.53
M47	.27	.45	D37	.31	.47
DB47	.77	.42	MB37	.84	.37
MB47	.84	.37	DB37	.85	.36
D46	.64	.48	M36	.30	.46
C46	.85	.46	C36	.69	.49
M46	.26	.44	D36	.66	.48
DB46	.91	.29	MB36	.91	.29
MB46	.92	.27	DB36	.86	.34
D45	.45	.50	L35	.23	.42
L45	.34	.50	D35	.65	.48
B45	.99	.20	B35	.96	.20
D44	.43	.50	L34	.26	.44
L44	.15	.36	D34	.55	.50
B44	1.00	.17	B34	.99	.12

Since most contact areas were found on the occlusal surfaces of the first molars, Figure 5 shows the contact frequency on the surfaces of all four first molars. The greatest numbers of contacts were registered on the upper molars in the distolingual (distopalatine) and mesiolingual (mesiopalatine) regions. By analogy, more than 50% of contacts were found on the lower teeth in the distobuccal and mesiobuccal cusps. On the upper first molars, the tripod contact was registered most frequently in T and R areas, whereas in P area there was almost no contact (1%). The lowest number of contacts was found on the upper molars on the mesial side of the tooth (7-9%).

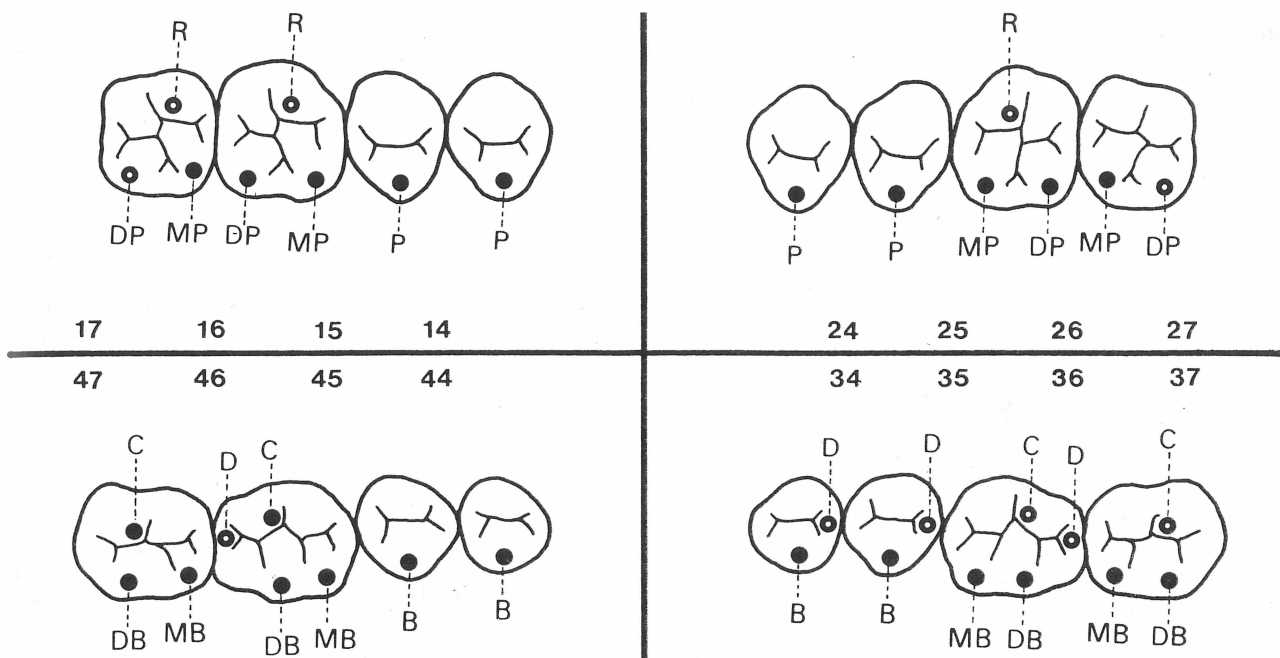


Figure 4. The occlusal contacts that are expected in normal adult dentition

Slika 4. Očekivani okluzijski dodiri u trajne eugnatne denticije

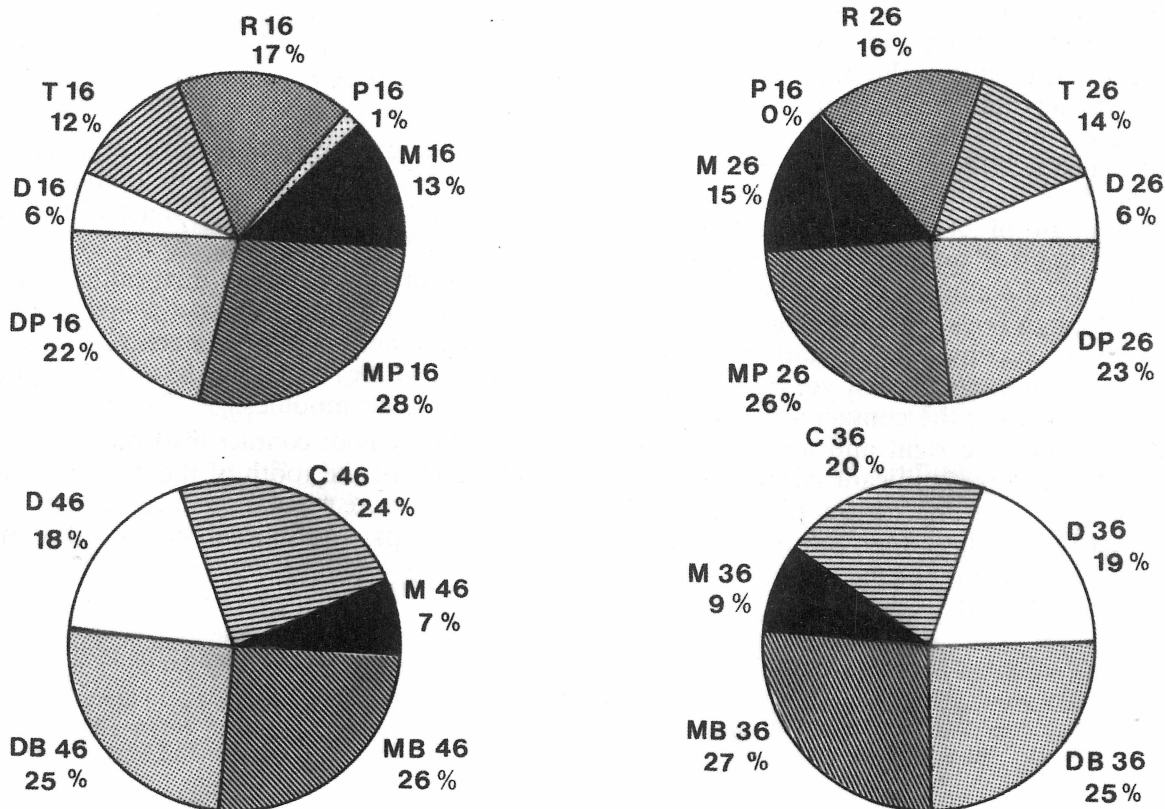


Figure 5. Distribution and frequency of occlusal contacts on surfaces of the first molars

Slika 5. Raspodjela i učestalost okluzijskih dodira na plohama prvih molara

Discussion

In the studied sample, there were on average 39.86 contact areas on the posterior teeth of both jaws. The contact between posterior teeth of the mandible and maxilla occurred at 20 sites. These results are in accordance with the investigations of McNamara and Henry (9), who studied the occlusal contacts in a similar sample (males aged 16 to 17 years) and registered 19.7 contacts (39.4 contact areas) at maximal intercuspitation. Using the photo-occlusive technique in 20 adults from Denmark, Athanasios et al. (2) found on average 23.8 contacts.

According to Jirbin (10), the number of occlusal contacts obtained by articulating paper does not significantly differ from the one obtained by the photoocclusion. She studied 30 eugnathic subjects, aged 13 to 28 years, and found 24.4 contacts using the photo-occlusive method and on average 23.4 contacts using the articulating paper. The average contact values are higher (2,10) than in our sample, because we only studied the occlusal surfaces of posterior teeth.

Distribution of the analyzed sample according to sex showed that there was a statistically significant difference in the number of contacts on female and male teeth. Athanasios et al. (2) studying the population aged 21–50 years, did not find such a difference. We observed adolescents aged 16 to 19 years, i.e., after the final eruption phase of 28 permanent teeth and primary functional adaptation. The dentition process after the shedding of the deciduous teeth is twice as long in boys (11), which means that at the age of 16, a complete adaptation and regular intercuspitation have not yet occurred.

When comparing the contact areas on posterior teeth, both the right and left sides, there was no statistically significant difference. Symmetry in relation to the sagittal plane is a basic characteristic of physiologic occlusion, and is necessary for a normal function of a stomatognathic system (2,4).

Maness et al. (4) have registered by the T-scan technique the most intensive touch in the region of the second premolar and first molar. In our sample, the contact areas were mostly registered in the region of the first and second molar, whereas the contact intensity could not be measured by the applied technique.

Further investigations and their comparison will allow better understanding of occlusal contacts, as well as the application of the method in the diagnosis and treatment of the stomatognathic pathologic conditions.

Conclusion

1. In eugnathic, healthy, young permanent dentition of the population from Croatia in the maximum intercuspitation position (centric occlusion), there were on average 20 occlusal contacts i.e., 39.86 contact areas on the posterior teeth of the mandible and maxilla.

2. There was symmetry in relation to the sagittal plane i.e., identical number of contacts on both the right and left sides.

3. Primary adaptation is not yet finished in males aged 16–19 years; the number of contact areas in the centric occlusion in males is statistically lower than the number of contacts on the female teeth.

4. The greatest number of registered contacts was in the area of the first molar (3.5 contacts) and on the occlusal plane of the second molar (2.9 contacts).

5. Analysis of contact distribution on occlusal planes of the tooth of the maxilla proved that there were regular contacts on mesiolingual (mesiopalatine) molar cusps, as well as on palatine premolar modules (88–97%).

6. Analysis of contact distribution on occlusal planes of the tooth of the mandible proved that there were regular contacts on mesiobuccal molar cusps and buccal cusps of premolars (84–99%).

RASPODJELA DODIRA STRAŽNJIH ZUBA U CENTRALNOJ OKLUZIJI

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Sažetak

U studiji je prikazana analiza okluzijskih dodira zuba pri maksimalnoj interkuspidaciji (centralnoj okluziji) u 74 ispitanika oba spola, u dobi od 16 do 19 godina, s kompletnom eugnatom denticijom. Artikulacijskim papirom registrirano je prosječno 39,76 dodira po ispitaniku na okluzijskim plohama stražnjih zuba. Od ukupnog broja dodira, 8% lokalizirano je na atipičnim dijelovima okluzijskih ploha što navodi na zaključak da u analiziranoj posteruptivnoj fazi druge denticije još nije došlo do potpune stabilizacije okluzije. Usporedbom broja dodira u odnosu na mediosagitalnu ravninu utvrđena je simetrija to jest jednak broj kontakata na lijevoj i desnoj strani zubnog niza. Broj registriranih okluzijskih dodira među zubima u ženske populacije statistički je značajno veći nego u muškaraca. Najveći broj okluzijskih kontakata pri maksimalnoj interkuspidaciji nađen je u području prvog i drugog molara. U radu je također detaljno prikazan razmještaj i učestalost dodira na okluzijskim plohama svih stražnjih zuba.

Ključne riječi: dodiri zuba, centralna okluzija

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