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# The Distribution of Periodontal Disease and Loss of Attachment in Jaw Sextants in Different Age Groups – Cross-Sectional Study

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## ABSTRACT

*The distribution of periodontal disease stages is not the same in both human jaws, parts of the same jaw or in different ages of life. In the sample of 2,730 sextants, 455 persons 15+ years of age, analysis of distribution of both periodontal disease and loss of attachment in jaw sextants in different age groups was made, using the Community Periodontal Index (CPI) and Loss of Attachment (LA). Statistical significance testing was checked using the Pearson Chi-Square-test with probability of 95%. Healthy periodontium is mostly found in upper anterior sextant (36%,  $p < 0.001$ ), and bleeding on probing in lower right sextant (25.45%,  $p < 0.001$ ). There is most calculus in lower anterior sextant (48.19%,  $p < 0.001$ ), followed by upper posterior (15–17%). Deep pockets are more often in lower anterior sextant (31.87%,  $p < 0.001$ ), and upper and lower posterior sextants are without teeth in 18–20.5% of cases, but lower anterior sextant in only 7.73% ( $p < 0.001$ ). Cumulative minimal loss of attachment (0–3 mm) significantly is more often present in upper anterior sextant (21.2%,  $p < 0.001$ ), while values 5–11 mm are more often in lower anterior sextant (25–43%,  $p < 0.001$ ). Loss of attachment  $\geq 12$ mm appears in only 1.4% present sextants and it is rear on left jaw side. Significant differences in distribution of both periodontal disease and loss of attachment appear in age 30+.*

**Key words:** periodontal disease, loss of attachment, distribution in jaw, age groups.

## Introduction

The distribution of periodontal disease stages is not the same in both human jaws, parts of the same jaw or in different

ages of life. According to the old periodontal disease progression model, calculus should be one of stages in develop-

ment of periodontitis and loss of tooth. Nevertheless some authors more often find pockets on approximal sites in lower right posterior sextant than in lower anterior or upper posterior sextants, where there are the most calculus deposits<sup>1-2</sup>. If there are good oral hygiene habits, calculus doesn't have to retain periodontitis causing bacteria. Accompanied with irregular brushing method and mucogingival problem it leads to loss of attachment clinically seen as recession rather than inflammatory periodontal disease.

The problem that appears in determining periodontal disease degree, especially in older population, is a high number of posterior teeth extracted. This is the reason why we cannot determine possible prevalence and severity of disease in this location. For a long time there was predominate opinion that periodontal disease is the most frequent cause for tooth loss, but the newer researches find more often decay, sociocultural and economic reasons (high price of veneers) as a cause. Takala et al. as a reason for tooth loss find decay or tooth root without crown (70%), periodontal disease (20%) and prosthetic reasons (10%)<sup>3</sup>.

The purpose of this paper is to analyze the distribution of both periodontal disease and loss of attachment degrees in jaw sextants in different age groups (cross sectional study). Cumulative results will be compared with similar researches in the world. The distribution causes would be tried to explain.

## Materials and Methods

Baseline data were obtained by examination of 3,730 sextants (455 persons (43% males and 57% females) of two different rural areas – mountain (Krasno) and littoral village (Sveti Juraj) near city of Senj, Adriatic coast, Croatia) aged 15+, classified in 7 age groups. Persons with total extraction were not included in the

study. Subjects had diverse socio-economic status and both sexes were equally represented. The CPI – E periodontal probe, mouth mirror and artificial standard illumination of dental unit were used to carry out a basic periodontal examination using the Community Periodontal Index (CPI, WHO, 1997) and Loss of Attachment (LA, WHO, 1997) procedure<sup>4</sup>. The results were written in WHO Oral Health Assessment Forms (WHO, 1997)<sup>4</sup>. Probing was conducted by one dentist (S. Špalj), as a guarantee of equal criteria, in a period between January 1999 and May 2000. The dentition was divided in six sextants, and the highest values found on referral teeth (17 or 16, 11, 26 or 27, 37 or 36, 31, 46 or 47) were recorded. Statistical significance testing was checked using the Pearson Chi-Square-test with probability of 95%.

## Results

We got very similar results for each age group and cumulative for all age groups. In all groups and cumulative, healthy periodontium is the most frequent finding in upper anterior sextant (36%,  $p < 0.001$ ). Bleeding on probing cumulative and in age 20–29 is the most frequent in lower right posterior sextant (25.45%,  $p < 0.001$ ), and in age 30–64 in upper anterior. It is the most rear in lower anterior sextant. There is the most calculus in lower anterior sextant (48.19%,  $p < 0.001$ ), and after that in upper posterior (between 15% and 17%), while there is the lower percent in upper anterior. The difference in distribution of shallow pockets is not significant. We find it in upper and lower anterior sextant in 19% of cases, and a little lower percentage in posterior (15–17%). Deep pockets again are more often in lower anterior sextant (31.87%,  $p < 0.001$ ), because other sextants were excluded. Upper and lower posterior sextant are excluded in 18–

TABLE 1  
PERIODONTAL DISEASE DISTRIBUTION IN JAW SEXTANTS

Age	Sextant	H	B	C	P1	P2	X	Σ
15–19	1	11	26	12	0	0	2	300
	2	32*	17	0**	1	0	0	
	3	9	21	16	1	0	2	
	4	17	26	3****	1	0	3	
	5	7****	17	26*	0	0	0	
	6	15	25	5	4	0	1	
20–29	1	9	12	30****	5	1	8	396
	2	31*	22	3*	4	0	7	
	3	11	15	22	8	0	11	
	4	18	24	9****	6	0	8	
	5	5****	9****	49*	2	1	0	
	6	15	37*	6**	2	0	6	
30–34	1	3	6	17	6	3	12	282
	2	9	19*	3***	9	1	6	
	3	6	5	11	14	0	11	
	4	9	15	6	8	1	8	
	5	3	1**	34*	6	2	1****	
	6	9	15	4****	6	0	13	
35–44	1	2	3	9	16	2	47****	468
	2	14**	13****	3**	19	2	27	
	3	2	4	9	17	1	45	
	4	6	9	6****	11	1	42	
	5	3	0***	48*	18	5	6*	
	6	5	11	5****	11	2	44	
45–54	1	2	2	5	8	3	43	378
	2	8***	8***	5	10	3	29	
	3	3	0	5	11	4	40	
	4	1	4	4	14	2	38	
	5	0	0	31*	14	7	11*	
	6	1	5	7	16	3	31	
55–64	1	0	1	5	8	4	53	426
	2	3	6****	2****	18****	3	39	
	3	0	0	7	5	6	53	
	4	1	4	8	9	3	46	
	5	2	0	22*	17	7	23**	
	6	2	4	4	10	3	48	
≥ 65	1	0	0	3	6	1	70	480
	2	4*	1	5	9	4	57	
	3	0	0	2	5	3	70	
	4	0	3	1	5	3	68	
	5	0	0	16*	11	7	47	
	6	0	3	1	10	3	62	
Cumulative	1	27	50	81	49	14	235*	2,730
	2	101*	86	21	70	13	165	
	3	31	45	72	61	14	232	
	4	52	85	37	54	10	213	
	5	20	27	226*	68	29***	88	
	6	47	100*	32	59	11	205	

\*p < 0.001; \*\*p < 0.005; \*\*\*p < 0.01; \*\*\*\*p < 0.05

1 = upper right sextant; 2 = upper anterior sextant; 3 = upper left sextant; 4 = lower left sextant; 5 = lower anterior sextant; 6 = lower right sextant; H = healthy; B = bleeding on probing; C = calculus; P1 = shallow pocket 4–5mm; P2 = deep pocket ≥6mm

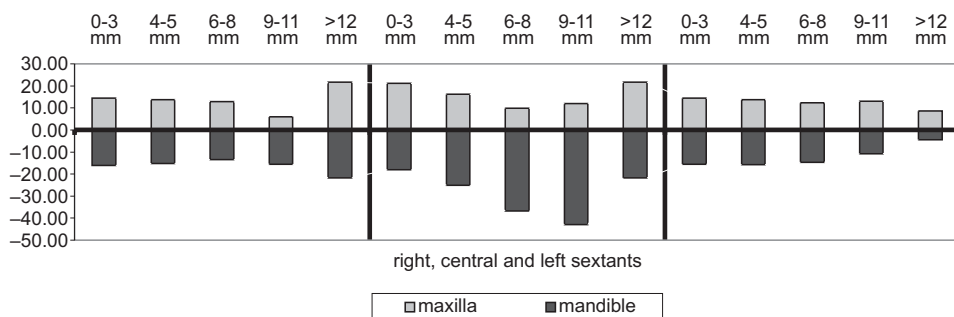


Fig. 1. The cumulative distribution of loss of attachment in jaw sextants.

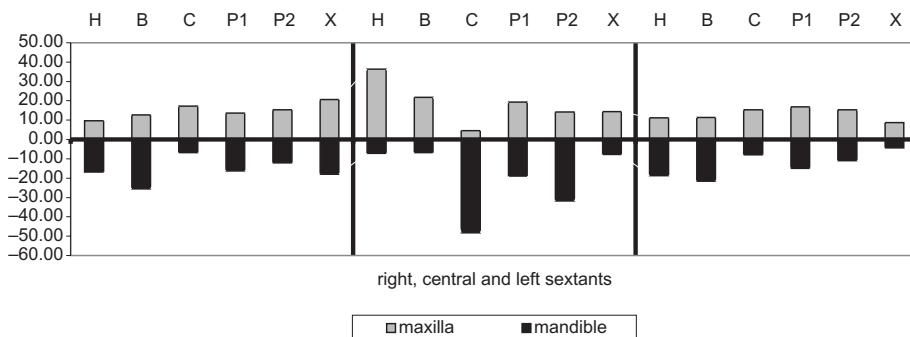


Fig. 2. The cumulative distribution of periodontal disease in jaw sextants.

20.5% of cases, and lower anterior in only 7.73% ( $p < 0.001$ ). If we, according to CPI methodology, presume that every calculus formation and pocket bleeds, and every pocket has calculus present and add values for those codes, we come to very similar distribution of bleeding, calculus and shallow pockets in posterior and upper anterior sextant (Table 1, Figure 2).

Significant differences in attachment loss distribution appear over 35 years of age, and they are almost equal for cumulative and particular values. There is significant higher cumulative minimal loss of attachment (0–3 mm) in upper anterior sextant (21.2%,  $p < 0.001$ ), while for code 5–11 mm there is higher in lower anterior sextant (25–43%,  $p < 0.001$ ). Loss of at-

tachment  $\geq 12$  mm appears in only 1.4% of present sextants and it's more rear on left side of jaw (Table 2, Figure 1). The prevalence of periodontal disease in this geographic area appears to be very high. More than 50% of the 30+ population has either deep or shallow pocket, while approximately 40% of the 55+ population has at least one deep pocket. More than 90% of the examinees need some kind of periodontal treatment<sup>5</sup>.

### Discussion and Conclusions

Calculus formation is mostly found on lower anterior and upper posterior teeth because of nearness of salivary glands excretory channel. It can be found there in all age groups. In age 45+ it appears in-

**TABLE 2**  
LOSS OF ATTACHMENT DISTRIBUTION IN JAW SEXTANTS

Age	Sextant	0–3 mm	4–5 mm	6–8 mm	9–11 mm	≥12 mm	Σ
15–19	1	45	3	0	0	0	292
	2	49	1	0	0	0	
	3	46	2	0	0	0	
	4	46	1	0	0	0	
	5	49	1	0	0	0	
	6	47	2	0	0	0	
20–29	1	47	10	0	1	0	356
	2	54	6	0	0	0	
	3	45	10	0	0	0	
	4	51	7	0	0	0	
	5	57	7	2	0	0	
	6	55	3	1	0	0	
30–34	1	24	8	2	1	0	231
	2	29	10	2	0	0	
	3	22	14	0	0	0	
	4	25	11	3	0	0	
	5	26	17	2	1	0	
	6	22	10	2	0	0	
35–44	1	7****	14	8	1	1	257
	2	28*	16	2****	4	1	
	3	10	11	11	0	0	
	4	14	12	9	0	0	
	5	18	30*	17**	9*	1	
	6	13	14	2****	3	1	
45–54	1	3	12	2	1	2	186
	2	19*	7	5	1	1	
	3	5	11	3	4	0	
	4	2	15	4	3	0	
	5	6	26**	14**	7	0	
	6	4	15	9	3	2	
55–64	1	4	7	6	1	0	164
	2	10	14	5	1	2	
	3	3	7	3	5	0	
	4	2	14	6	3	0	
	5	5	16	14**	10**	3	
	6	3	12	5	3	0	
≥65	1	1	3	4	0	2	106
	2	2	13***	3	4	1	
	3	0	2	4	2	2	
	4	0	5	3	3	1	
	5	2	7	14*	9***	1	
	6	1	7	4	4	2	
Cumulative	1	131	57	22	5****	5	1,592
	2	191*	67	17****	10	5	
	3	131	57	21	11	2	
	4	140	65	25	9	1	
	5	163	104*	63*	36*	5	
	6	145	63	23	13	5	

\*p < 0.001; \*\*p < 0.005; \*\*\*p < 0.01; \*\*\*\*p < 0.05

1 = upper right sextant; 2 = upper anterior sextant; 3 = upper left sextant; 4 = lower left sextant;  
5 = lower anterior sextant; 6 = lower right sextant

significantly more often in upper anterior or lower posterior sextants, then in upper posterior due to higher number of excluded latter sextants. Oral hygiene is better on left jaws side, because right-handed people (majority in population) do there better cleaning. They also pay more attention to anterior teeth (especially upper) then the posterior one. Nevertheless bleeding on probing is most frequent finding in upper anterior and lower posterior sextants, which could be explainable with higher calculus frequency in other sextants. We note it as higher disease level. Similar data was published in Germany, Norway, Hong-Kong, United States, Switzerland and Taiwan<sup>1–2,6–9</sup>. Posterior teeth, due to worse cleaning, have more frequent decay that untreated lead to endodontal disease. Dentists more often extract those teeth, due to its more complex endodontal morphology and consequently its more complex endodontal therapy. Due to esthetics patients gives more attention to anterior teeth and neglect the posterior. That is why the posterior sextants are more often without teeth in both dental arches. Despite of calculus as most often finding in lower anterior teeth, patients most rear lose them. It denies the old presumption that periodontal disease linearly progress including continuum of stages beginning with bleeding, followed by calculus deposits to formation of pocket and consequently to loss of tooth. Presence of shallow pockets in age 55–64 is more often in anterior then posterior. It is only significant distribution of pockets, explainable again by frequency of excluded sextants. In other age groups pockets are rather proportional distributed in all sextants.

Significant differences in distribution of attachment loss appear not until 35 years of age. It is almost rule for 0–3 mm loss of attachment to appear most often in upper anterior sextant, followed by lower anterior. Attachment loss values

over 4 mm are also connected primarily with lower anterior sextant. It is again explainable by more frequent exclusion of posterior sextants. Apart from this accumulation of the calculus on lingual sites lower anterior teeth increases non-inflammatory attachment loss. At persons under the age of 29. 4–5 mm attachment loss is insignificantly more often in posterior sextants, especially upper. Those losses originate predominately due to mechanical trauma and consequently recession, as well as due to mucogingival problem and not because of inflammation. These conclusions also made examinations in Japan, Sweden and South Australia<sup>10–12</sup>.

Posterior sextants are more frequent excluded, especially on right side and in maxilla, because right-handed persons do better cleaning of left side resulting in better health and more rear extraction in that segment. These findings published Horning et al. and Wenström et al.<sup>2,11</sup>.

Okamoto et al. find deeper pockets and higher attachment loss on posterior then the anterior teeth, as well on approximal sites. On buccal sites they find the shallowest pockets. In generally plaque, gingivitis, deeper pockets and higher attachment loss are more frequent on approximal sites, and more rear on buccal. Under the age of 50 higher attachment loss appears on buccal then on the lingual sites, due to irregular brushing method<sup>10</sup>.

According to Henne et al. the highest percentage of healthy periodontium, as well as blending gingiva is in upper anterior sextant. In lower anterior sextant there is more often finding of concretions, while shallow and deep pockets in lower right posterior sextant<sup>1</sup>.

Grytten et al. find most frequent calculus without bleeding on probing in lower anterior sextant, while calculus with bleeding in lower left posterior sextant<sup>6</sup>. Holmgren et al. have the same finding of

calculus without bleeding as Grytten, but calculus with bleeding find more often in upper left sextant<sup>7</sup>. According to Dong et al. supragingival and/or subgingival calculus with or without bleeding on probing is more frequent in lower anterior sextant<sup>9</sup>.

Horning et al. find insignificantly higher frequency of periodontitis in right quadrant and in mandible, while gingivitis and extracted teeth in maxilla<sup>2</sup>.

Joss et al. find more plaque in anterior then in molars and premolars area, while deeper pockets, higher attachment loss, more bleeding sulcus and more overhanging margins in posterior section. Premolars in all cases have least values. Loss of attachment and probing depth do not vary significant with different tooth types but different sites. Buccal anterior teeth sites have one-half less risk for attachment loss value  $\geq 5$  mm then the premolars and molars<sup>8</sup>.

According to Wennström et al. buccal sites have less attachment loss then the lingual and approximal. They notice in twelve-years period higher growing of attachment loss on buccal sites in younger then in older, due to irregular brushing method and not due to plaque induced in-

flammation. Posterior teeth are more frequent excluded (81%) then the anterior (18%), but very rear canine (only in 5% of cases)<sup>11</sup>.

According to Hohlfeld et al. average attachment loss is higher on posterior than the anterior teeth, also mesial and distal then buccal and lingual<sup>13</sup>. Slade et al. add finding that attachment loss is higher on mediobuccal then the disto- and mesiobuccal tooth site<sup>12</sup>.

Loss of attachment value  $\geq 4$  mm is more frequent in molars of both jaws and sites then in anterior teeth, published by Dolan et al. The same attachment loss came more often in lower then in upper anterior teeth. LA  $\geq 7$  mm is also more frequent in upper molars then in anterior, while in mandible it is a little frequent in anterior then on posterior teeth. Persons with fewer teeth more often had LA  $\geq 7$  mm<sup>14</sup>.

Our results mainly correlate with published data in the world. The differences appear in distribution of higher attachment loss severity. In our examination higher attachment loss note anterior sextants, while Joss, Okamoto, Slade, Hohlfeld and Dolan find higher loss on posterior teeth<sup>8,10,12–14</sup>.

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## **DISTRIBUCIJA PARODONTNE BOLESTI I GUBITKA PRIČVRSKA U ČELJUSNIM SEKSTANTIMA U RAZNIM ŽIVOTNIM DOBIMA**

### **S A Ž E T A K**

Distribucija stupnjeva parodontne bolesti nije jednaka u obje ljudske čeljusti, dijelovima iste čeljusti kao niti u različitim životnim dobima. Na uzorku od 2730 sekstanata 455 osoba dobi iznad 15 godina analizirana je distribucija parodontne bolesti i gubitka pričvrška u različitim dobnim skupinama korištenjem Parodontnog indeksa zajednice (CPI) i Gubitka pričvrška (LA). Statistička signifikantnost testirana je Pearsonovim  $\chi^2$  testom s vjerojatnošću od 95%. Zdrav parodont najčešći je nalaz u gornjem središnjem sekstantu (36%,  $p < 0.001$ ), a krvarenje u donjem desnom sekstantu (25.45%,  $p < 0.001$ ). Kamenca najviše ima u donjem središnjem sekstantu (48.19%,  $p < 0.001$ ), te nakon toga u gornjim lateralnim (15–17%). Duboki džepovi češći su u donjoj fronti (31.87%,  $p < 0.001$ ), gornji i donji lateralni sekstanti su bez zubi u 18–20.5% slučajeva, a donja fronta je bez zubi tek u 7.73% ( $p < 0.001$ ). Kumulativno minimalni gubitak pričvrška (0–3 mm) signifikantno je veći u gornjem središnjem sekstantu (21.2%,  $p < 0.001$ ), dok je za veličine 5–11 mm češći u donjem središnjem sekstantu (25–43%,  $p < 0.001$ ). Gubitak pričvrška  $\geq 12$  mm javlja se u tek 1.4% prisutnih sekstanata i rjeđi je na lijevoj strani. Signifikantne razlike u distribuciji parodontne bolesti i gubitka pričvrška javljaju se iznad 30. godine života.