Odontometric analysis of deciduous teeth from the Late Antique and the Early Mediaeval period in archaeological populations from Croatia

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Abstract

Odontometric researches of deciduous teeth of archaeological populations are extremely rare. The purpose of this study was to obtain data on dimensions of deciduous teeth in Croatian archaeological populations from the Late Antique and the Early Mediaeval period. For this purpose skeletal remains of 58 subadults were used. The maximum mesiodistal diameter of the tooth crown, the maximum mesiodistal diameter of the tooth neck, the maximum buccolingual crown diameter, maximum height of the crown, the maximum length of the crown, the maximum length of the tooth root were measured and the robustness of teeth was calculated. Obtained data were compared with existing odontometric data of recent populations. No statistically significant differences between the archaeological and recent populations were found.

Keywords: Early Mediaeval Period; Odontometrics; Late Antique; Deciduous Teeth; Croatia

Introduction

Traditional history describes the transition from the Late Antique (3rd to 5th centuries AD) to the Early Medieval period (6th to 10th centuries AD) in Croatia as uniformly catastrophic with destruction of major urban centers, depopulation, famine, and the spread of epidemic diseases (1).

This was an extremely turbulent period, accompanied by many wars between the Roman Empire and the people who inhabited the area. Early Mediaeval period marked the arrival of the Croats and the establishment of the kingdom. During this period, the Croatian society, demography and economics was deeply changed. The most populated areas were along the Adriatic coast, hence the majority of sites come from this area. Therefore, it is not surprising that the greatest archaeological sites are found right there.

In archeological investigations teeth are very important elements of skeletal remains because they are known as the most enduring mineralized tissue in the human body. Teeth are resistant from mechanical, chemical and physical destruction. They are very important for identification of skeletal remains, especially when a point of investigation is to obtain data about odontometric changes in population. Odontometrics could be very useful to determine sex and age of skeletal remains (2). Identifying and measuring of skeletal remains is important for number of reasons. First, obtained data may help in identifying archaeological skeletal remains that are accessible only by teeth. Second, such information can be used to determine phylogenetic relationships among archaeological and recent population. Most of recent studies have shown differences in odontometric features in specific populations (3–5)

The purpose of this paper is to obtain data of dimensions of deciduous teeth in Croatian archaeological populations from the Late Antique and the Early Mediaeval period and provide new information that may be useful in developing odontometric profile for those periods.

Materials and methods

In the study, skeletal remains from southern Croatia (Zadar, Radašinovci, Šibenik, Velim Veliš tak and Glavice) and eastern Croatia (Osijek, Zmajevac and Privlaka) were used (Figure 1 and Figure 2). The osteological materials are stored in Croatian Academy of Science and Art. The differences between the archaeological subadult population and the modern Croatian population were the main aim of this study.

Measurements of deciduous teeth were taken with a sliding calliper. Mesiodistal diameter of the tooth crown is taken as the greatest mesiodistal dimension parallel to the occlusal and facial surface. Mesiodistal diameter of the tooth cervix is taken as the greatest mesiodistal dimension parallel to the

occlusal and facial surface measured in the cervical part of the tooth crown. Buccolingual crown diameter is the greatest distance between the facial and lingual surfaces of the crown, taken at right angles to the plane in which the mesiodistal diameter is taken (5). Crown height is defined as the distance from the tip of the highest cusp to the cervical line on the buccal side. To avoid the possibility of incorrect measurements caused physiological destructions as abrasion or fracture, only teeth with no or low level of tooth wear were included.

Results of measurements were rounded to one decimal place to be more similar to results from recent population.

Data analysis was carried out by Statistica 6.1. (Statsoft Inc.) and Microsoft Excel 2007. P-values less than 0.05 were considered statistically significant.

Results

For analysis, a total of 58 individuals (19 from Antiquity and 39 from the Early Mediaeval period) were selected. Analyses included 154 teeth from Antiquity and 328 from the Early Mediaeval. Measurements of deciduous teeth were taken only on teeth without tooth wear. Teeth with morphological anomalies were excluded. As expected upper and lower deciduous molars were the most frequently available for analysis. Upper and lower deciduous central incisors were most frequently missing.

The measurement of the mesiodistal diameter of the tooth crown was conducted on a total of 415 deciduous teeth. Table 1 contains the descriptive statistics for the deciduous teeth from the Antiquity and the Early Mediaeval. The buccolingual diameter of the tooth crown was measured on total of 477 deciduous teeth. Table 2 shows the descriptive statistics of deciduous teeth from both periods. The height of the tooth crown was measured on total of 471 deciduous teeth. The results of these descriptive statistics are shown in Table 3. Table 4 contains the descriptive statistics for the mesiodistal crown measurements which were obtained from 459 osteological samples.

There were no statistically significant differences between archeological and recent deciduous teeth. However, the quantity of analyzed data may be too small to glean correct information about changes in deciduous teeth during these periods.

Discussion

In this research 58 skulls from the Late Antique and Early Mediaeval period were examined for

odontometric analyses. According to available literature, most anthropological studies of deciduous teeth have been based on relatively small samples.

Skeletal remains from the Late Antique and Early Medieval Periods are not often preserved from taphonomic destruction. Moreover, the analyzed skeletal samples from the listed locations are relatively small and unfortunately poorly preserved.

Mesiodistal and buccolingual diameters of the primary tooth crown are two most commonly used and researched features used. Vodanović et al. made an investigation about dimensions of primary teeth in children from the early Medieval Ages (5). The research was conducted on 85 intact deciduous teeth from the site of Bijelo Brdo in Eastern Slavonia in Croatia (10th-13thcentury). They concluded that there were no statistically significant differences between the Bijelo Brdo culture group and more recent populations. Subsequently, Njemirovskij et al. compared mesiodistal width of lower incisors in recent and early medieval populations from continental and coastal parts of Croatia (6). Mesiodistal width of the central and lateral lower incisors decreased from the medieval times until today in the continental part of Croatia, but increased in the coastal part. This may be explained by different dietary patterns in these two parts of Croatia, both in the past and nowadays. Different dietary patterns can produce different masticatory forces which influence the level of approximal tooth wear (6). Metric analysis of deciduous teeth from the Bronze Age in Syria, Haddow and Lowell discovered a statistically significant difference between modern Near Eastern populations and Mesopotamian populations. However, in this case, it is necessary to include factors such as the genetic makeup and migration of the people (7).

According to the period of death, ante-mortem and post-mortem teeth abrasion are possible. Ante-mortem tooth abrasion is caused by diet, jaw size and chewing stresses during the life. Post-mortem teeth abrasion is caused mostly by mechanical or chemical damages that affect the teeth after death. Antemortem and post-mortem dental abrasion can easily be recognized according to different wear patterns. Ante-mortem abrasion mostly affects the occlusal and approximal teeth surfaces of teeth and is highly positive correlated with age. There are many different classification methods of teeth abrasion, based on macroscopic or microscopic examination of the changes on tooth surface. Macroscopic changes are often visible (localized facets of smooth and shiny enamel, areas of exposed dentine). In order to avoid mistakes, in this study all teeth exhibiting macroscopic changes on the surface were excluded from further measurements (8).

This investigation of primary teeth differences shows that, at minimum, late Antique upper canines differ from modern canines. Changes in diet, food availability and sophisticated tools may have played a role in selecting for bigger upper canines in recent suadult populations. However, for more accurate assumptions, it is necessary to develop a universal model of teeth from archaeological and recent populations.

Conclusion

Although the sample size from in this analysis is small, dimensions of primary teeth are useful for anthropological data, odontology and forensic studies of living and historical populations. Knowledge of odontometric measures of primary teeth of ancient and early medieval population can be useful for making an anthropological profile, but for this it is necessary to include a large number of samples of archaeological populations.

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Figure 1. Map of Croatia with geographical location of archaeological site, red circle – Late Antique, black circle – Early Mediaeval period.

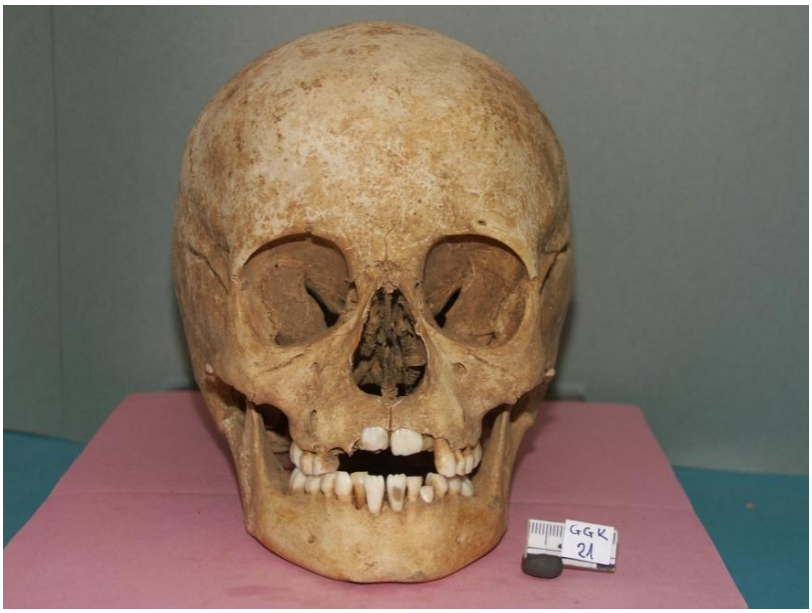

Figure 2. Skull from Glavice site.

	Maxilla - Tooth type					
	Central incisors	Lateral incisors	Canine	1st molar	2nd molar	
N	2	6	9	23	27	
Mean(mm)	6.3	5.2	6.3	6.9	8.6	Late Antique
SD(mm)	0.1	0.2	0.6	0.4	0.4	
N	7	14	15	42	50	
Mean(mm)	6.3	5.2	6.8	6.8	8.7	Early Mediaeval
(mm)	0.5	0.4	0.7	0.4	0.4	
Mean(mm)	6.5	5.1	7.0	7.3	8.2	Recent population (9)

	Mandible - Tooth type					
	Central incisors	Lateral incisors	Canine	1st molar	2nd molar	
N	4	17	12	25	29	
Mean(mm)	4.5	4.7	5.7	7.8	9.7	Late Antique
SD(mm)	0.6	0.4	0.3	0.4	0.4	
N	8	16	19	52	61	
Mean(mm)	5.0	4.9	6.1	8.4	9.5	Early Mediaeval
SD(mm)	0.3	0.4	0.4	0.6	0.5	
Mean(mm)	4.2	4.1	5.0	7.7	9.9	Recent population (9)

N=number of analyzed teeth; Mean=average; SD= standard deviation.

Table 1 Descriptive statistical analysis of mesiodistal diameter of the tooth crown

	Maxilla - Tooth type					
	Central incisors	Lateral incisors	Canine	1st molar	2nd molar	
N	2	6	9	23	27	
Mean(mm)	4.4	4.8	5.8	8.7	9.6	Late Antique
SD(mm)	0.1	0.4	0.5	0.4	0.4	
N	8	16	19	52	61	
Mean(mm)	5.0	4.9	6.1	8.4	9.5	Early Mediaeval
(mm)	0.3	0.4	0.4	0.6	0.5	
Mean(mm)	5.0	4.0	7.0	8.5	10.0	Recent population (9)

	Mandible - Tooth type					
	Central incisors	Lateral incisors	Canine	1st molar	2nd molar	
N	4	17	12	25	29	
Mean(mm)	4.3	4.3	5.4	7.2	8.7	Late Antique
SD(mm)	0.6	0.4	0.2	0.5	0.5	
N	13	23	29	50	52	
Mean(mm)	3.8	4.2	5.5	6.9	9.7	Early Mediaeval
SD(mm)	0.3	0.3	0.3	0.5	9.7	
Mean(mm)	4.0	4.0	4.8	7.0	8.7	Recent population (9)

N=number of analyzed teeth; Mean=average; SD= standard deviation.

Table 2 Descriptive statistical analysis of buccolingual crown diameter

	Maxilla - Tooth type					
	Central incisors	Lateral incisors	Canine	1st molar	2nd molar	
N	2	6	9	23	26	
Mean(mm)	6.1	5.8	7.2	5.7	5.8	Late Antique
SD(mm)	0	0.5	0.4	0.4	0.5	
N	8	16	19	52	60	
Mean(mm)	6.3	6.1	7.4	5.6	5.9	Early Mediaeval
SD(mm)	0.8	0.5	0.3	0.5	0.4	
Mean(mm)	6.0	5.6	6.5	5.1	5.7	Recent population (9)

	Mandible - Tooth type					
	Central incisors	Lateral incisors	Canine	1st molar	2nd molar	
N	4	17	12	25	28	
Mean(mm)	5.8	6.4	7.1	6.2	6.0	Late Antique
SD(mm)	0.6	0.4	0.3	0.5	0.5	
N	8	16	19	52	61	
Mean(mm)	5.5	6.4	7.4	6.3	6.0	Early Mediaeval
SD(mm)	0.8	0.5	0.5	0.5	0.5	
Mean(mm)	5.0	5.2	6.0	6.0	5.5	Recent population (9)

N=number of analyzed teeth; Mean=average; SD= standard deviation.

Table 3 Descriptive statistical analysis of crown height

	Maxilla - Tooth type					
	Central incisors	Lateral incisors	Canine	1st molar	2nd molar	
N	2	7	10	23	24	
Mean(mm)	4.2	3.5	4.5	5.5	6.4	Late Antique
SD(mm)	0.2	0.6	0.4	0.5	0.8	
N	8	16	18	51	59	
Mean(mm)	4.5	3.5	4.8	5.3	6.3	Early Mediaeval
SD(mm)	0.6	0.3	0.6	0.5	0.5	
Mean(mm)	4.5	3.0	3.7	6.5	7.2	Recent population (9)

	Mandible - Tooth type					
	Central incisors	Lateral incisors	Canine	1st molar	2nd molar	
N	0	13	12	23	28	
Mean(mm)	0	3.1	4.1	6.4	7.4	Late Antique
SD(mm)	0	0.3	0.4	0.6	0.6	
N	13	20	26	49	51	
Mean(mm)	2.9	3.2	4.3	6.5	7.4	Early Mediaeval
SD(mm)	0.3	0.3	0.5	0.6	0.5	
Mean(mm)	3.0	3.0	3.7	6.5	7.2	Recent population (9)

N=number of analyzed teeth; Mean=average; SD= standard deviation.

Table 4 Descriptive statistical analysis of mesiodistal diameter of the tooth cervix