

Ancient Dental Prostheses Unearthed In Greece

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In ancient dentistry one can find amazing prosthetic devices used to manage dental problems such as stabilizing mobile teeth or adding artificial teeth in the case of tooth loss, either for ornamental or functional purposes. The discovered dental prostheses in Europe and the Mediterranean are classified in two major categories, depending on how they are manufactured. The first major category is the dental constructions of gold foil which are found almost exclusively in the area of Etruria.

These are ring-shaped gold foils, which could be characterized as tetrahedrons, adapted precisely to the bearing teeth. One of the rings usually (bore) carried an artificial tooth that was held in the chamber formed by the ring with a nail. Each ring was joined to the next one with a cold solder joint. In some rare cases, instead of successive joined rings, the gold foil forms a large oval shaped ring which adapts to the tooth. Most of these foil dental prostheses were placed on the anterior teeth, mainly in the upper incisors.¹

The second major category includes constructions made of gold wire. These constructions are simple but perhaps more functional. They can be further classified based on the technique used to retain the artificial tooth and/or to secure them to the natural teeth. In contrast to the foil prostheses, their number is overwhelmingly smaller and their geographical spread greater as they have been discovered in different geographical areas of the eastern Mediterranean: Egypt, Phoenicia and Greece.²

In Greece we come across both types of ancient dental prostheses: the wire one (eastern Mediterranean) and the foil one (Etruria). This was largely to be expected, considering its position in relation to both the Italian peninsula and the Eastern Mediterranean region. Platschick, in 1904, assumed that we should expect both types of dental prostheses to be detected in Greece,³ without

apparently knowing the findings of excavations in the area. This hypothesis was verified by the discovery of two dental prosthetic devices in Eretria and Tanagra. Thus, the National Archaeological Museum in Athens is the only museum of the world, which has in its collection both of the two distinct types of dental prostheses found in the Ancient World: a) the elaborate wire dental prosthetic construction of Eretria, which is found in the Eastern Mediterranean, and b) the foil-mallet dental construction of Tanagra, Etruscan style.

The dental prostheses were named after their alleged excavation site: Eretria and Tanagra, respectively.

The dental prosthesis of Eretria

Little is known about the discovery of this prosthesis (Fig. 1). Unfortunately, until now, the results of the research in the archives of both the 11th Ephorate of Prehistoric and Classical Antiquities and the National Archaeological Museum are meagre.



Fig1: Eretria dental prosthesis.
National Archaeological Museum of Athens.

The only available evidence is the relevant entry in the Index of gold items of the Vase and Minor Arts Collection of the National Archaeological Museum where it was introduced and catalogued at the beginning of the last century:

«Τέσσαρες ὀδόντες ἀνθρώπου, συνδεδεμένοι διὰ χρυσοῦ σύρματος καὶ χρησιμεύσαντες εἰς ἀντικατάστασιν πεσόντων ἄλλων. Εὐρέθησαν πλησίον κρανίου παρά τὴν κάτω σιαγόνα.»

["Four human teeth, connected by a gold wire, and served to replace the fallen others. They were found near the skull next to the lower jaw ⁴."]

According to the entry, this finding comes from Eretria, "from the excavations by Kourouniotis 1900-1901 and in the estate of Karlis".

However, this dental prosthesis is not found in any of the publications concerning findings from Eretria, either by Kourouniotis⁵ or by Papavassiliou.⁶

If the Karlis estate is identified with the estate of Doctor Karalis, according to Papavassiliou, then it is unlikely that it was found in this excavation as according to Papavassiliou only a trial excavation was carried out with findings not worthy of any reference.⁷

Strangely, both Bliquez and, more importantly, Becker cite as a bibliographic reference to the discovery

of Eretria's dental prosthesis the inclusion of Papavassiliou in the Proceedings of the Athens Archaeological Society for the year 1902. This is clearly a misunderstanding. Especially in Becker's case, the inability to understand the Greek text is obvious. He misleads the reader, as in his description he states that the dental prosthesis was a gold stater that was worn on the face of a woman in the period before the Alexander the Great.⁸ He does not comprehend that the term "stater" refers to the coin found in a marble larnax. The coin on one side shows the bust of Alexander the great and on the other the winged victory. We must emphatically point out that there is no reference to dental prostheses in Papavassiliou records.



Fig.2: Fig. 2: Labial view of Eretria Prosthesis



Fig.3: Lingual view of Eretria Prosthesis

If we study the sequence of findings entered in the in the Index of gold items of the Vase and Minor Arts Collection, we come to the conclusion that they are all contained in the publication of Kourouniotis (1913). The only difference is that the dental prosthesis is absent from the publication and seems to be curiously and unjustifiably included in the Index of gold items, without any explanation being given.

De facto and in the absence of any other evidence, we are obliged to rely on the accompanying findings, which are recorded both in the publication of Kourouniotis, and, more importantly, in the Index of gold items of the Vase and Minor Arts Collection, accepting Eretria as its place of discovery. So it seems that this is probably a prosthesis dating back to the 4th century B.C..

Additionally, L. Kokkoris, the first professor of dentistry at the University of Athens, reported in 1918: "(No. 12764) four teeth threaded by of gold floss, which belongs to the skull of a woman, found in a grave of the 4th century B.C. at Eretria."⁹ The same exact information is reproduced by Adam in 1947,

who apparently draws his data from Kokkoris.¹⁰ However, it should be noted that due to the lack of other evidence of accompanying findings and skeletal residues it is impossible to determine gender only by tooth morphology.

A prosthetic device of gold wire and four teeth have been salvaged (Fig.2,3). Based on tooth morphology, they belong to a mandible, but they were found outside the skull, as indicated in the relevant entry in the Index of gold items of the Vase and Minor Arts Collection. Hence, it is not known how many teeth the construction included in total, which were the abutment teeth or whether it was placed when the person was alive, whether it was functional. The surviving teeth are the left central incisor, the left lateral incisor, the right canine, as well as another central incisor whose characteristics indicate that it does not belong to the same person as the other three teeth. It differs in colour, but also in the dimensions of the crown and the root, while the incisal angles are sharper and clearer than in the other central incisor (Fig. 4). It does not have the pronounced abrasion we observe in the other three teeth. The position of the teeth in the construction is inconsistent with the normal position of the teeth in the arch.

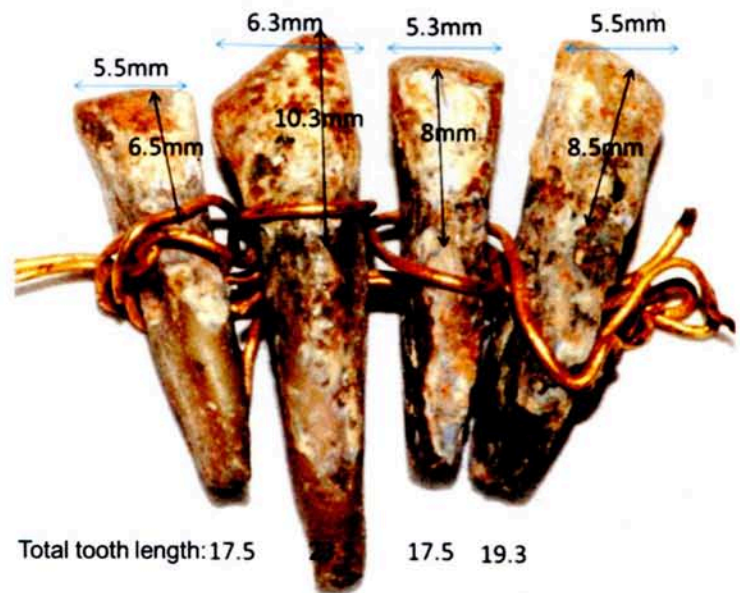


Fig .4: Measurements of the teeth in Eretria Prosthesis

It should be emphatically noted that the canine is located between two central incisors and excels in both incisal and the apical margin.

The apexes of all teeth have been mechanically smoothed, without being at the same level (Fig. 5). As a result, the dental prosthesis, apart from the wrong placement of the canine, has almost zero chance of being functional, with the canine hampering both the alveolar crest and the occlusal plane.



Fig. 5: Apexes of all teeth were cut and smoothed

It is difficult to believe that someone who had anatomical knowledge of the mouth and knew the morphology of the teeth would produce such a bulk construction. However, it is admirable that the holes have been made with high precision, probably with a drill, in all four teeth (Fig. 6). They are round with a diameter of 2.5 mm. Thus, it is an oxymoron that the quality of the preparations of the teeth is so high, i.e. the high precision of the shape, the smooth and uniform boundaries and also the smoothing of the apical edges. On the other hand, the binding is particularly complex and bulky (Fig. 7), intensifying our doubts as to the functionality of the construction. It consists of a 0.5mm thick wire, made by winding an extremely thin pure gold tape, characteristic of the period (Fig. 8).



Fig. 6: Clear morphology of the drilled holes.



Fig. 7: Bulk wiring on one end.



Fig. 8: The gold wire was made by twisting a thin tape of pure gold.

It consists of four wires (Fig. 9, 10). The first forms a loop that hugs the right incisor with one end of the wire entering the hole from the mesial surface and exiting the distal surface, while the other end embraces the labial (fig. 11).



Fig. 9: Four gold wires were used for the splinting.



Fig. 10: X-ray of the Eretria Prosthesis, using different shooting angles (A, B).

Then the two ends enter together into the holes of the remaining teeth, ending on the distal surface of the left lateral incisor. The second gold wire is bounded in 8 shape around the surfaces of the canine and the right incisor, ending on the distal surface of the right incisor. At this point, both ends of the second wire pass through a loop formed by a third wire. The third wire bends lingual, runs doubled at the crevices of the lingual surfaces of the four teeth and finally reaches the distal surface of the left incisor. The fourth wire comes around the left central and lateral incisors in 8 shape. Finally, this also ends up on the distal



Fig. 11: Right incisor end of the wiring.

surface of the left incisor where it twists around the double wire which comes from the lingual surface. A large number of wires are assembled on the distal surface of the left incisor (fig. 7), the endpoints of which appear broken, making it impossible to conclude how the device was fastened to the abutment teeth. The huge bulk of wires do not seem very convenient for clinical application. Simply put, this construction is unlikely to function in this form as it is very difficult for the patient to tolerate its application in the mouth and more over to chew with it.

However, it is paradoxical that the ancient, dental craftsman would have proceeded to such careful grinding of the apical area, if it were not to be placed in the mouth. Since, as we were assured by the National Archaeological Museum, the dental prosthesis has not undergone any maintenance whatsoever, from the day of receipt until today. Nevertheless, it should not be excluded that the construction has been modified in an earlier time, most likely during the excavation process.

The dental prosthesis of Tanagra

The first publication of the Tanagra dental prosthetic construction (Fig. 12) was carried out in 1899 by

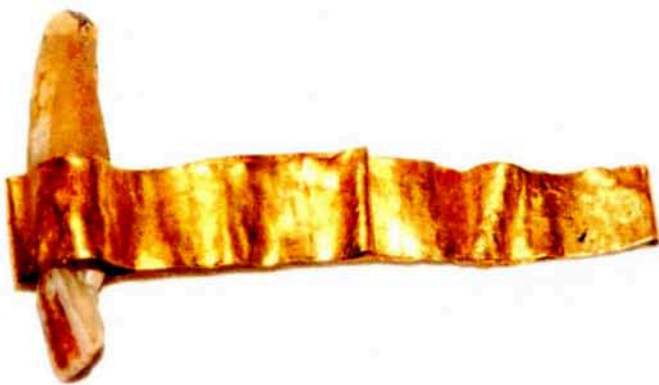


Fig. 12: The dental prosthesis of Tanagra.
Archaeological Museum of Athens.

Deneffe, which provides us with crucial data on finding and dating it.¹¹ The bridge of Eretria was presented in 1909 by Guerini, a few years after its finding. Unfortunately, Guerini simply publishes images of the two dental prostheses without mentioning anything about them, apparently because he did not study them in person.¹² This publication was the beginning of an extended presentation of both prostheses with a common feature reproduction of the same low-definition black and

white image without additional information, with a single epidermal commentary. For example, the image is reproduced by Sudhoff (1921)¹³, Taylor (1922)¹⁴, Clowson (1934)¹⁵, Lufkin (1938)¹⁶, Weinberger (1946¹⁷, 1948¹⁸), Micheloni (1976)¹⁹, Bliquez (1996)²⁰, Becker (1996)²¹, Beck-Mannagetta (2003)²², while Emptoz (1987)²³, although referring to Eretria's prosthesis, presents as an image an irrelevant dental prosthesis rather than the real one.

The dental prosthesis of Tanagra, along with 902 other medical tools, mostly bronze and bone ones, belonged to the private collection of Dr. Lambrou, and was donated in 1899 to the National Archaeological Museum²⁴. Today, it belongs to the Copper Collection and it has the catalogue no. 358.

The conditions under which the Tanagra prosthesis was found are not known. The only information comes from Deneffe. Lambrou told him that this prosthesis was purchased along with other archaeological objects from Thebes and the seller reported that it was found in a tomb at the location Chlembotsari (Asopia) of the wider area of ancient Tanagra. Prior to its sale, Tanagra's prosthesis was part of a private collection that was accessible to the public without restrictions, so visitors could examine it with their own hands whatever this entails for archaeological objects.

Deneffe describes the prosthesis as follows:

"This is an elliptical ring, made of a strip of very pure gold, very malleable, 5 mm in height. It should be used to fix two mobile central incisors to the lateral incisors. The four incisors should be surrounded by the gold ring. However today (i.e. in 1899) the construction appears to contain only one incisor, but its previous owner had made it known to Lambrou that there were all four incisors in the gold ring. In this construction there were no intermediate partitions for the teeth, nor any trace of a nail indicating that an artificial tooth was fixed. In the same tomb were found votive offerings of tanagraies daughters which date from the 4th to 3rd century. B.C."²⁵

Unfortunately, despite the plethora of bibliographic references to the Tanagra appliance, it seems that none of these authors has studied it closely, leading to arbitrary conclusions. For example, Bliquez merely reproduces Deneffe's description, without further promoting research²⁶. Becker, without having studied it lively, as he admits, speculates that the ring contained six teeth of the mandible, i.e. the four incisors and the two canines and that the tooth that the structure now carries probably did not belong to its owner²⁷.

His view that that it was a woman is correct as in the same tomb were found Tanagraies daughters as votive objects. The daughters were usually used as funeral parables in the graves of young women. It is unlikely that this is an Etruscan woman, since these statuettes accompanied women throughout their lives from childhood to death, and it is a purely Greek burial custom. It is difficult to imagine Tanagraies daughters to accompany the burial of a woman of Etruscan origin. More recently (2000) Scheider supported two conflicting and incomprehensible views. On one hand, he accepts Becker's view that it is a mandible prosthetics. On the other hand, he uses the relationship of the ring and the existing tooth and

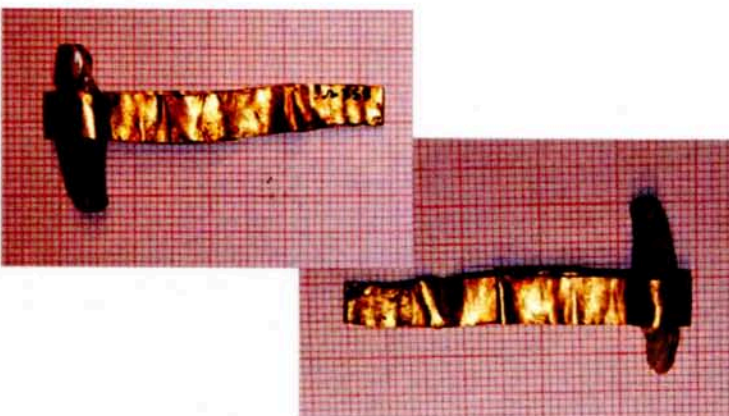


Fig. 13: Both sides of the Tanagra Prosthesis on millimeter guide rule.

argues that the foil is quite low in the cervical area of the tooth and this fact indicates extensive loss of the alveolar bone. Of course, this view contradicts the previous one concerning the prosthesis of the mandible, since the tooth present in the appliance is a central incisor of the maxilla rather than the mandible²⁸. The study of the prosthesis in its current state (Fig. 13) reveals pronounced deformities, so it is extremely difficult to draw conclusions about its original form and function.

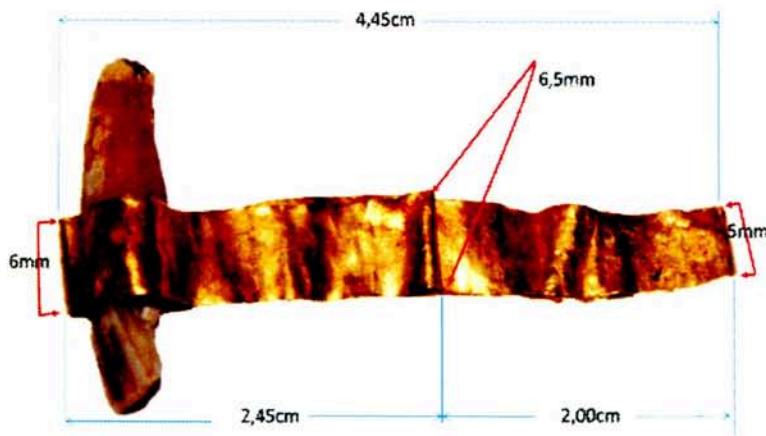


Fig. 14: Dimensions of the Tanagra Prosthesis

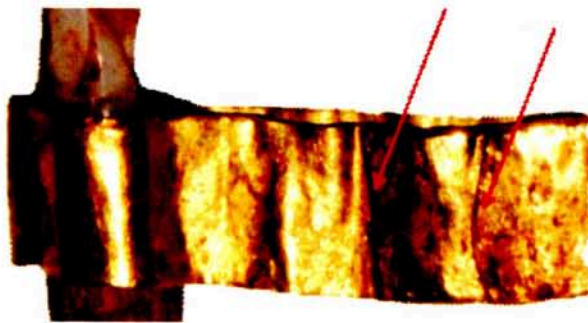


Fig. 15: Two welding lines on one surface

The structure consists of two gold foil rings, 0.2 mm thick and various heights from 5 mm to 6.5 mm (Fig.14). Although the middle area of the construction is not clearly visible due to deformation, its careful observation indicates the existence of two welding lines on the lingual surface (Fig.15). The observation of the top view confirms the existence of two rings with forged welding (Fig. 16).

Finally, the thickness of the foil in the areas of welding is multiple ranging from 0.4mm to 0.75 mm (Fig.16). This fact confirms the existence of more rings.

The tooth in the prosthesis is the left central incisor of the maxilla based on its morphological characteristics which are typical and clear. Its overall condition, however, is no better than that of construction. It is fractured and a part of the crown has been lost, while its position in the gold ring is not stable. Based on the dimensions of the construction, this must have included six (6) teeth. What were the teeth that it included and whether the present position of the surviving tooth was the original is called into question. The problems stem from the fact that it is made of pure gold, which is soft and supple and then it was treated carelessly at the time before it was included in the collections of the National Archaeological Museum.

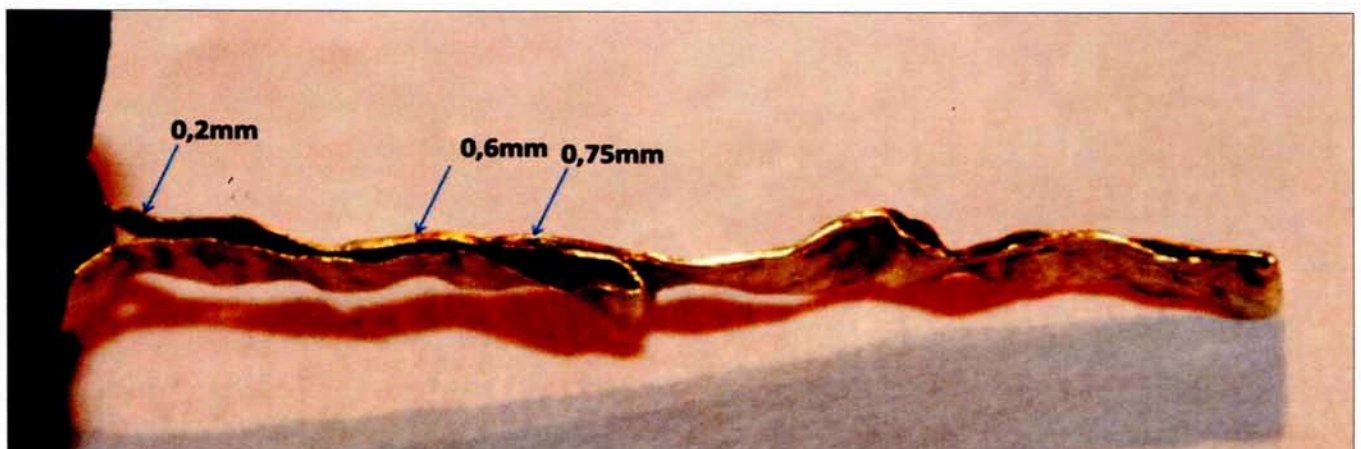


Fig. 16: The thickness of the gold foil is multiplied in the welding areas.

References

- 1 Koutroumpas D., *Ancient Dentistry*, Research Monograph, Athens: N.K.U.A., 2016: 282-308.
- 2 Koutroumpas D., *Ancient Dentistry*, Research Monograph, Athens: N.K.U.A. 2016: 309-321.
- 3 Platschick C., La via persona dall' odontoiatria, *La Stomatologia*. 1904-1905; 3: 241.
- 4 Index of gold items of the Vase and Minor Arts Collection of the National Archaeological Museum of Athens, Greece 1902: 174.
- 5 Kuruniotis K. Goldschmuck aus Eretria. *AM* 39. 1913:289-328.
- 6 Papavasileiou G. *On the ancient tombs in Evia (in Greek)*. Athens: Sakelariou P.D. 1910.
- 7 Papavasileiou G. *Excavations in Evia (in Greek)*. *Proceedings of the Archaeological Society at Athens*. 1902: 63-72.
- 8 Becker M.J. Early Dental Appliances in the Eastern Mediterranean. *Berytus*. 1995-96; 42: 87.
- 9 Kokkoris L. *History of Dentistry and Stomatology (in Greek)*. Athens: Papakonstantinou A. 1918: 52.
- 10 Adam. Dental Prosthesis in Antiquity(*in Greek*). *Stomatology*. 1947; IV(4):237.
- 11 Deneffe V. *La prothèse dentaire dans l' Antiquité*. Anvers: Caals H. 1899: 26-27.
- 12 Guerini V. *A History of Dentistry from the most ancient times until the end of the eighteenth century*. Philadelphia & New York: Lea & Febiger. 1909: 60.
- 13 Sudhoff K. *Geschichte der Zahnheilkunde*. Leipzig: Barth. J.A. 1926: 60-61.
- 14 Taylor J.A. *History of Dentistry: A Practical Treatise for the Use of Dental Students and Practitioners*. London & New York: Lea & Febiger. 1922.: 25.
- 15 Clowson D. M. Phoenician Dental Art. *Berytus*. 1934; 1: 26.
- 16 Lufkin A. W. *A History of Dentistry*. Philadelphia & New York: Lea & Febiger. 1948: 46.
- 17 Weinberger B. W. Further evidence that dentistry was practiced in ancient Egypt, Phoenicia and Greece. *Bulletin of the history of medicine*. 1946; 20 (2):191.
- 18 Weinberger B. W. *An Introduction to the History of Dentistry: With Medical & Dental Chronology & Bibliographic Data*. vol. 1. New York: The C.V. Mosby Company. 1948: 118.
- 19 Micheloni P. *Storia dell' odontoiatria*. vol. 1. Roma: Piccin. 1976: 264.
- 20 Bliquez L., Prosthetics in Classical Antiquity: Greek, Etruscan, and Roman Prosthetics. In: Haase W. & Temporini H. (ed.) *Aufstieg und Niedergang der römischen Welt (ANRW)*. II 37. 3. Berlin & New York: Walter de Gruyter. 1996.: 2645-2646.
- 21 Becker M.J. Early Dental Appliances in the Eastern Mediterranean. *Berytus*. 1995-96; 42: 86-87.
- 22 Beck-Mannagetta J. *Hippokrates und die Zahnheilkunde*. Salzburg: Druckerei Hutteger Ges.m.b.H & Co. KG. 2003: 23.
- 23 Emptoz F. La Prothèse Dentaire dans la Civilisation Étrusque. *Archéologie et Médecine: VII Rencontre Internationale d' Archéologie et d' Histoire (Antibes 1986) [actes du colloque]*. Editions A.P.D.C.A.: Juan-les-Pins. 1987: 549.
- 24 Proskinitopoulou R. National Archaeological Museum: A unique collection of copper fine arts. Re-exhibition of the Copper Collection. *Archaeology & Arts*. 2010: 86.
- 25 Deneffe V. *La prothèse dentaire dans l' Antiquité*. Anvers: Caals H. 1899: 26-27.
- 26 Bliquez L., Prosthetics in Classical Antiquity: Greek, Etruscan, and Roman Prosthetics. In: Haase W. & Temporini H. (ed.) *Aufstieg und Niedergang der römischen Welt (ANRW)*. II 37. 3. Berlin & New York: Walter de Gruyter. 1996: 2648.
- 27 Becker M.J. Early Dental Appliances in the Eastern Mediterranean. *Berytus*. 1995-96; 42:87-88.
- 28 Schneider H. *La prothèse dentaire dans l' Antiquité*. Thèse. Paris: Université René Descartes-Paris V. 2000: 34.