

2017

# Etruscan Gold Dental Appliances

Marshall Joseph Becker

*West Chester University of Pennsylvania*, [mbecker@wcupa.edu](mailto:mbecker@wcupa.edu)

Follow this and additional works at: [http://digitalcommons.wcupa.edu/anthrosoc\\_facpub](http://digitalcommons.wcupa.edu/anthrosoc_facpub)



Part of the [Archaeological Anthropology Commons](#)

---

## Recommended Citation

Becker, M. J. (2017). Etruscan Gold Dental Appliances. , 1, 523-534. Retrieved from [http://digitalcommons.wcupa.edu/anthrosoc\\_facpub/61](http://digitalcommons.wcupa.edu/anthrosoc_facpub/61)

This Book Chapter is brought to you for free and open access by the College of the Sciences & Mathematics at Digital Commons @ West Chester University. It has been accepted for inclusion in Anthropology & Sociology by an authorized administrator of Digital Commons @ West Chester University. For more information, please contact [wressler@wcupa.edu](mailto:wressler@wcupa.edu).

# Etruscology

---

Volume 1

Marshall Joseph Becker

31 Etruscan gold dental appliances — 523

Edited by  
Alessandro Naso

ISBN 978-1-934078-48-8

(PDF) 978-1-934078-49-5

(ePub) 978-1-61451-910-2

**Library of Congress Cataloging-in-Publication Data**

A CIP catalog record for this book has been applied for at the Library of Congress.

**Bibliographic information published by the Deutsche Nationalbibliothek**

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available from the Internet at <http://dnb.dnb.de>.

© 2017 Walter de Gruyter Inc., Boston/Berlin

Cover image: Fresco from the tomb of the Augurs, Tarquinia: Running Phersu (masked man) on the left wall. Ca. 520 BCE; Photo: Courtesy DAI-Rome

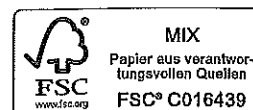
Typesetting: Satzstudio Borngräber, Dessau

Printing and binding: Hubert & Co. GmbH und Co. KG, Berlin/Boston

☉ Printed on acid-free paper

Printed in Germany

[www.degruyter.com](http://www.degruyter.com)



Marshall Joseph Becker

## 31 Etruscan gold dental appliances

**Abstract:** Dental appliances and retention bands, the forerunners of modern dental bridges (pontics), were invented by the Etruscans over 2,500 years ago. The earliest known example, from the ancient site of Satricum in Latium vetus, dates to ca. 650 BCE. Most of the known examples derive from Etruscan archaeological contexts in Italy. Some retention bands and complex bridges appear to be Roman adaptations of Etruscan technology. Etruscan forms went out of use as their culture was dominated and then absorbed by the Romans.

A significant recent discovery is that the Etruscan appliances were worn only by females, suggesting that cosmetics and vanity was the principal “dental” concern of these people. Also newly recognized is the specificity of the Etruscan pontics within the southern Etruscan region. The limited distribution of dental appliances provides a warning regarding attempts to view women’s roles as similar across the widely divergent cultures that were all part of the Classical world. In turn, these specific data make clear the wide variations in gender roles present throughout the ancient world.

**Keywords:** gold dental appliances, dental pontics, Etruscan women, ancient medicine

### Introduction

Ancient literary sources include many references to gold dental appliances. These were well known long before the first actual example was recovered from an archaeological context at the end of the eighteenth century.<sup>1</sup> Etruscan goldsmithing skills are well documented in numerous outstanding publications,<sup>2</sup> but their primacy in applying these arts to “dentistry” is less well known. More than 2,600 years ago, Etruscan goldworking talents were used to fashion complex cosmetic dental appliances, some of which had therapeutic value as well. Recent discoveries in physical anthropology, archaeology, the ancient literature, and social anthropology enable us to reexamine and understand specific aspects of the lives of southern Etruscan women. In turn, the written accounts and the archaeological record relating to other aspects of Etruscan life can be reviewed and further investigated.

Since 1885, an extensive literature has emerged dealing with the subject of these ancient appliances. Recent evidence indicates that the earliest examples date from the seventh century BCE. Nearly a dozen ancient dental appliances, in an amazing variety of shapes and sizes, are now known.<sup>3</sup> All appear fashioned from natural gold, which generally has a high silver content.<sup>4</sup>

---

1 Böttiger 1797.

2 E.g. De Puma 1987.

3 Becker and MacIntosh Turfa 2017.

4 Becker 2003.

While frequently cited by archaeologists, these ancient prostheses tend to be a subject more frequently discussed by dental or medical historians. Since Victor Deneffe's early effort, we have seen a considerable number of inventories emerge, and Mario Tabanelli attempts a true catalogue.<sup>5</sup> Assembling a complete corpus of Etruscan and other ancient dental appliances permits an evaluation of all aspects of this type of ancient technology. Dental as well as other ancient prosthetic devices are reviewed by Lawrence Bliquez, who also presents specific information regarding various dental prostheses and their history.<sup>6</sup> The Bliquez inventory includes many of the best available photographs of these items.<sup>7</sup>

Very little archaeological data relating to these prostheses is known.<sup>8</sup> Descriptions of the prostheses themselves are generally so poor as to foster errors in the literature. These various difficulties can be remedied only by detailed studies of each of the appliances. Don Clawson began careful studies of the limited dental and skeletal materials found in association with these prostheses.<sup>9</sup> His efforts, plus a review of the limited archaeological data, have provided new views of this subject.<sup>10</sup> Also important in understanding the contexts within which these appliances were made and used is the literary evidence<sup>11</sup> and the relationship of practitioners of medicine to those who performed dental extractions.<sup>12</sup> Collectively, this evidence provides an indication of how widely available this type of prosthetic device was to the ancient Etruscan elite,<sup>13</sup> and later to the Romans, reflecting a long history which can be documented archaeologically. The manufacture of dental appliances clearly was a skilled activity of goldsmiths or other craftsmen, rather than the work of barbers or physicians.

## 1 History: The origins of dental appliances

The earliest records of "dental care" appear in Egyptian medical papyri of the seventeenth and sixteenth centuries BCE.<sup>14</sup> These texts, however, relate only to medical treatments of the mouth and gums; references to dental prostheses are entirely absent. Many Egyptian texts long predate the Hippocratic corpus but are important in understanding the early history of dental medicine. Treatments for oral diseases

---

5 Deneffe 1899; Sudhoff 1926; Casotti 1947; Tabanelli 1963.

6 Bliquez 1996.

7 See also Emptoz 1987.

8 See Cozza and Pasqui 1981; Waarsenburg 1995.

9 Clawson 1934.

10 Becker 2005.

11 Becker and MacIntosh Turfa 2017.

12 Becker 2014.

13 Becker 1990.

14 Badre 1986.

long predate the development of dental appliances, which first emerge in the Etruscan world in the seventh century.<sup>15</sup>

Dental prostheses from Near Eastern regions all date to the fifth century or later.<sup>16</sup> Vincenzo Guerini suggested that the Egyptians may have decorated teeth with gold after death, but he recognized that they produced no dental prostheses.<sup>17</sup> The Near Eastern prostheses were all fashioned from gold or silver wire and were intended to stabilize loose teeth. The ancient Near Eastern technique was still being used in European and North American dentistry well into the twentieth century.

François Emptoz's outstanding summary of the evidence reveals that in 1914 Hermann Junker found what was called "wired teeth" in a tomb at Giza dating from 2500 BCE.<sup>18</sup> Emptoz concluded that these "teeth" were actually an amulet, and I concur. The supposed primacy of Egyptian or Phoenician dental appliances<sup>19</sup> is nowhere supported by direct evidence. Clawson put it best when he stated that "contrary to the beliefs of various writers," whom he cites, "detached archaeological specimens of Egyptian prosthetic dentistry do not seem to exist."<sup>20</sup>

The precise origins of dental appliances predate the sixth century. By 630 BCE, a high-status resident of ancient Satricum was buried wearing a complex and sophisticated gold dental appliance.<sup>21</sup> This find suggests that skills in the production of dental prostheses extend at least back to the middle of the seventh century. The archaeological evidence spanning the next few hundred years has revealed the general availability of such gold prosthetic devices in Etruria. The number buried in tombs is indicated clearly by the many examples which survive,<sup>22</sup> as well as a specific reference to them in the ancient Roman literature; in the Law of the Twelve Tables. This law sought to restrict the burial of gold dental appliances with their owners, perhaps to reduce mortuary ostentation but also to discourage tomb looters.

The Etruscans were the first to develop true dental bridges (pontics). These devices generally provided a distinct ring or separated space for each tooth and were anchored to sound teeth. These appliances usually provided the means for replacing one or two missing teeth. Quite interesting, however, is the fact that no examples of gold bridgework appear to survive from the period of the later Roman Republic or the Empire, although literary references clearly attest to their presence. Bliquez rightly dismisses Guerini's suggestion that by the Late Republic, full sets of removable den-

<sup>15</sup> See also Bliquez 1996: 2659, n. 18, citing Hoffmann-Axthelm 1985, 28–31, 38–39.

<sup>16</sup> Becker 1997, amending Masali and Peluso 1985; Corruccini and Pacciani 1989, 61.

<sup>17</sup> Guerini 1909, 28.

<sup>18</sup> See Becker 1997.

<sup>19</sup> Lufkin 1948; Woodforde 1967.

<sup>20</sup> Emptoz 1987, 546; Clawson 1934, 23–24.

<sup>21</sup> Waarsenburg 1995:366; Becker and MacIntosh Turfa 2017, no. 18.

<sup>22</sup> Cf. Becker 1999b.

tures were being produced.<sup>23</sup> Even if this were the case, a demand for bridges would have continued, and later examples should be known. Roman prostheses were being removed before burial, or were looted from graves. Poor documentation when recovered may have led to the inclusion of examples in the corpus without appropriate archaeological documentation that would allow us to assign a correct date.

## 2 Functions

While all the known Etruscan dental appliances appear to be cosmetic, the later Roman examples generally were functional. A few simple gold bands, in the form of long ovals, are known from Etruscan as well as Roman contexts, but no dates can be assigned to them.<sup>24</sup> The lengths of these bands indicate that three or more teeth were circled by a single loop. Some of the simple bands may have been purely ornamental, but others may have been used to stabilize teeth loosened by a blow or by periodontal disease. Both cosmetic and functional dental appliances are mentioned in the ancient texts.<sup>25</sup> The Etruscan examples of dental bridges are particularly interesting because they uniformly replace one or both upper central incisors.<sup>26</sup> Since these teeth are the least likely to be lost naturally to decay or periodontal woes, the evidence strongly suggests deliberate removal.<sup>27</sup> Deliberate extraction (evulsion) of incisors is a common cultural practice around the world, although Italic examples are less well known.<sup>28</sup> These cosmetic appliances, designed to fill the gap left by teeth deliberately removed, would also serve to maintain the remaining teeth in their correct places, although it may not have been an intended feature of the appliances. A well-fitted ornamental false tooth would assure continued proper articulation of the remaining teeth and their continued efficient function. This is one of the principal goals of modern orthodontics. The individual's own teeth, deliberately removed, could be recycled by being cut down and fitted into the appliance inserted into the owner's mouth. "Recycling" one's own teeth would also guarantee a correct color and size match.<sup>29</sup>

The Latin poet Martial (ca. 39 – ca. 103 CE) indicated that various substitutes for human teeth were commonly employed in antiquity, such as bone or ivory (Spect. 1.72). Even the tooth of an ox is incorporated into one Roman appliance. I agree with Bliquez and others that goldsmiths, ivory carvers, and other artisans fabricated these

<sup>23</sup> Guerini 1909, 100. See Bliquez 1996: 2661.

<sup>24</sup> See Becker 1999b.

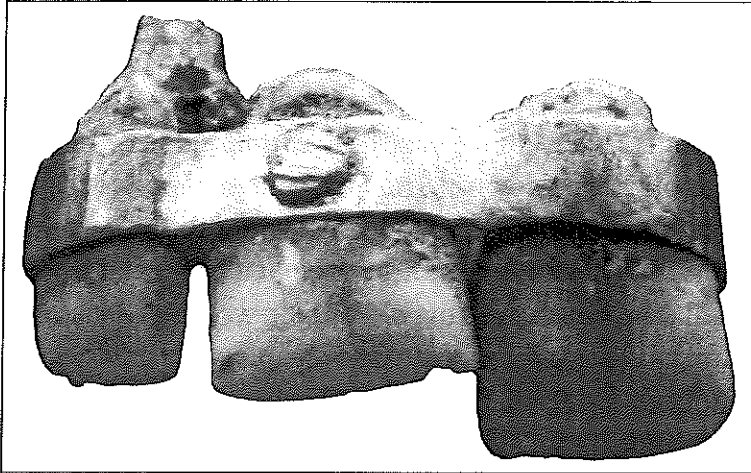
<sup>25</sup> Becker and MacIntosh Turfa 2017.

<sup>26</sup> Becker 1992b.

<sup>27</sup> Becker 2002.

<sup>28</sup> See Robb 1997a, 1997b.

<sup>29</sup> Becker 1995b; see also Guerini 1909, 71–73, 79; Deneffe 1899, 78; Casotti 1947, 669.



**Fig. 31.1:** Etruscan gold dental appliance. Already collection R. Aichmeir, Linz (photo R. Aichmeir)

appliances.<sup>30</sup> The makers fitted these devices as cosmetologists, independent of the dentists, who did extractions, or the physicians, who prescribed for diseases of the mouth.

An Etruscan dental appliance maker required the skills of a goldsmith who could also fashion the false teeth and do the fitting (Fig. 31.1). Such a person would have been an extremely talented craftsman. Knowledge of tooth shapes and the fitting of gold bands to them is highly developed in the Copenhagen example. When well installed, a complex appliance provided a much better fit and greater stability for the teeth than is achieved through the use of a single long gold band. The individual rings of the appliances provide us with a direct indication of the measurements of the anterior teeth of the individuals who wore these appliances. These measurements are uniformly within the range of Etruscan female dentition.

### 3 The Copenhagen bridge: A unique ancient dental pontic

The best described of all the surviving examples of Etruscan dental appliances is the example in the Department of Near Eastern and Classical Antiquities, Danish National Museum, Copenhagen. This piece serves as a good example of ring-constructed Etruscan pontic. The Copenhagen specimen, believed to have come from Orvieto, was known as early as 1927, when it was probably found in a major tomb.<sup>31</sup> It

<sup>30</sup> Bliquez 1996: 2662; Guerini 1909, 102; Hoffmann-Axthelm 1985, 30 n.

<sup>31</sup> Riis 1941, 161; Poulsen 1927, 47.

was mentioned or illustrated thereafter by several authors.<sup>32</sup> Detailed descriptions of the appliance and the associated teeth became available more recently.<sup>33</sup>

The Copenhagen appliance is a complex variation of a simple gold band type that was meant to encircle several teeth. There are at least four variations in construction among the score of dental appliances known.<sup>34</sup> The Copenhagen appliance was assembled from three small separate gold rings, or “loops.” Each of the three loops of the Copenhagen appliance is seamless, formed by drawing out a ring from a solid piece of gold or by making a small loop from a strip of gold by cold welding the ends.<sup>35</sup> The lateral loops were then joined at their adjacent surfaces by invisible cold welds. The lateral loops were curved in such a way as to conform to the base of each dental crown, with specific fitting done after the false tooth had been set in place and the appliance was ready to be inserted. The three small gold loops were then carefully fitted or custom designed to surround both “anchor” teeth and the false tooth, now missing. Anchor or “post” teeth are the sound or living teeth to which the bridge was attached to hold it in place. This appliance, like all the Etruscan examples, was meant to be worn in the upper jaw of an adult female. The lateral loops in this example were fitted over the upper left central incisor (I1) and the right lateral incisor (I2), with the right central incisor (I1) being “replaced.” No rivet was used to hold the false or replacement tooth in the center ring of the Copenhagen appliance, although this was the most common method used in other Etruscan examples.

The central band was formed as a sharply rectangular “box.” The replacement tooth, either the one deliberately removed or a substitute of ivory or bone, would have been a “crown” only. If not the cut-down (root-removed) original, this replacement would have been carved with its upper, exposed portion mimicking the tooth that it replaced. The lower part or base of the false tooth was square-cut to fit into the “box.” The angular shape would prevent it from slipping or rotating in its fitted collar. No rivet (pin) was needed since the false tooth was held in place the way a gemstone is fixed in a setting: this small rectangular band held the false tooth just as a goldsmith would insert a gem into a bezel setting. The false tooth was secured in place by pressing the soft gold tightly around it. The bridge has a design remarkably similar to modern examples. The appliance was meant to be a permanent fixture, although direct use of the replacement tooth would loosen the appliance. The Copenhagen-type pontic was more effective than bridges incorporating only a single long band with teeth riveted into position in the center, as in the Liverpool examples.<sup>36</sup>

<sup>32</sup> Johnstone 1932a, 132 n., pl. 94.17–18 (cf. Johnstone 1932b); Marvitz 1982, 49; Pot 1985, 38–39; Bliquez 1996: 2656–57.

<sup>33</sup> Becker 1992b, 1994a, 1995a.

<sup>34</sup> E.g. Becker 1994b, 1996.

<sup>35</sup> Becker 1994a.

<sup>36</sup> Johnstone 1932a, 1932b; Becker and MacIntosh Turfa 2017.



Anthropological techniques provide new means of interpreting the considerable body of existing evidence from the Classical world. Recently collected biological data relating to these appliances plus the use of cultural models provided by social anthropologists enables us to decode this extensive array of data in ways that make clear aspects of gender roles present in ancient Etruria. A detailed description appears elsewhere,<sup>37</sup> but of particular interest here are the measurements of the three teeth involved, as indicated by the dimensions of the gold rings and the portions of teeth that survive. These can be inferred both from direct measurement as well as by comparison with photographs taken when the associated teeth were better preserved.<sup>38</sup> Direct study of the anthropometric data reveals that these dental appliances were worn only by women.<sup>39</sup> This is evident from the size of the teeth involved. These are in the female range, much smaller than the teeth of males in this same population. Based on comparative dental wear, the woman represented by the teeth in the Copenhagen appliance appears to be over thirty years of age, but probably under fifty.

These comparisons are possible because we now have available extensive dental information from a central Italic Iron Age population.<sup>40</sup> More specifically we now have considerable dental data from later periods at the southern Etruscan city of Tarquinia,<sup>41</sup> where the greatest concentration of these appliances was found. The evidence clearly demonstrates that only women wore these appliances. The gendered use of these appliances is reinforced by the archaeological evidence from one of the two known contexts for which any excavated evidence had been recorded. Obviously, the actual measurements of the involved teeth are more clearly documented from the individual loops of the pontics than can be inferred from gold bands. The possibility that dental loss was a result of leprosy has been considered, but rejected due to the gender specificity of the known examples.

## 4 Discussion

Comparison of the newly available evidence from the Etruscan skeletal record<sup>42</sup> also indicates that the loss of upper central incisors, the teeth most commonly replaced by these Etruscan pontics, would have been an extremely rare phenomenon in women under the age of sixty.<sup>43</sup> This correlates with other evidence suggesting that the delib-

---

<sup>37</sup> Becker 2005.

<sup>38</sup> See Marvitz 1982, 49.

<sup>39</sup> Becker 1994b.

<sup>40</sup> E.g. Becker and Salvadei 1992.

<sup>41</sup> Becker 1990, 1993, 2000.

<sup>42</sup> Becker 2000.

<sup>43</sup> Becker 2002.

erate removal of healthy incisors from these women was necessary to enable these decorative appliances to be worn.<sup>44</sup>

These discoveries bring us back to the literary evidence, and in particular to the many ancient texts indicating that Etruscan men and women dined together. Etruscan gender relationships were unlike those of the Romans and Greeks, who practiced gender “avoidance” while eating and saw the Etruscan cultural form as disturbing (see chapter 14 Colivicchi). Like the Etruscan use of decorative dental appliances, these dining customs faded as the Roman Empire altered the behaviors of the Etruscan elite in the first century BCE.

Long ago, Rodolfo Lanciani noted that the tombstone of an ancient Roman dentist named Victorinus had an instrument of his trade depicted on it—a pair of dental forceps.<sup>45</sup> Other medical practitioners in Rome, of both Greek and Roman origin, also had similar tools shown on their funerary monuments.<sup>46</sup> The numerous medical kits known from antiquity, however, do not include the specialized tools that are needed by the goldsmith. Nor do we find any literary evidence that suggests that gold dental appliances were fashioned by any of the people more directly involved in the medical arts.<sup>47</sup> We can also reject the thesis that any of these appliances was used to effect a deliberate shifting of teeth. Orthodontics is clearly a twentieth-century invention dependent on modern developments in metallurgy and other areas. Dental implants were also made possible only by later twentieth-century technology.<sup>48</sup>

A distribution map of ancient dental appliances demonstrates that this technology appears to have been concentrated in southern Etruria.<sup>49</sup> The few examples found beyond the borders of this specific part of ancient Etruria can be explained by two factors relating to the movement of the Etruscan women wearing these appliances. These women may have been buried outside their native territories as a result of high-status marriage alliances between upper class Etruscan mercantile families and foreign trading partners; or they may have been accompanying their husbands who ventured beyond their homeland while conducting the business that made the Etruscans wealthy. These inferences are but a small part of the complex patterns that can be reconstructed through a detailed study of the surviving corpus of dental appliances.

The evidence also suggests that the use of these appliances was not a cultural custom found throughout the Etruscan realm.<sup>50</sup> Unless there were radically different

<sup>44</sup> Cf. Robb 1997a, 1997b.

<sup>45</sup> Lanciani 1892, 353.

<sup>46</sup> Lanciani 1892; Jackson 1988, 119.

<sup>47</sup> Bliquez 1996: 2662; Becker 1998.

<sup>48</sup> Becker 1999a, also 1994c.

<sup>49</sup> Becker 2002

<sup>50</sup> Cf. Becker 1992a.

mortuary patterns in central and northern Etruria, perhaps involving the removal of such appliances from the deceased, we must conclude that this technology was a part of the ornamentation of women primarily found in southern Etruria.

Of considerable interest is the evolution of this technology. The earliest dated example of a dental appliance is the Satricum appliance, from no later than 650. This has a hollow gold tooth attached to a thin band and is the only one to use a gold replacement tooth.<sup>51</sup> Since we have no evidence to indicate that this hollow-tooth technique was ever repeated, we may conclude that it was soon discontinued. This suggests that by 600 the use of false teeth—human, or carved to look like natural teeth—had become the fashion. This appears to relate to the finding that where a specific evaluation of gender has been made, all those wearing these gold bands were women.

At this time we have no means of dating most of the gold dental appliances known from ancient Italy. However, as Mary Johnstone indicated, the Etruscans clearly were the first to construct true dental bridges.<sup>52</sup> The tentative sequence for these dental appliances suggests a constant, if slow, development in the techniques of applying dental bridges. Any apparent improvement need not reflect chronological aspects of ancient dentistry. The use of a more successful method of fitting a dental appliance may reflect only the greater concern of this “dentist,” or the greater skills of a goldsmith who was fashioning the bridge. Various examples suggest that a few talented individuals may have carried their craft to unusual heights, but those achievements did not continue after the decline of ancient Rome, being reinvented centuries later by modern practitioners. If the Copenhagen bridge represents an evolved form of dental appliance within the ancient world, then we can see a stage from which the next logical step would be the formation of a solid gold tooth which might have mastication among its functional aspects.

## 5 Conclusions

1. The earliest pontics were made by Etruscans solely for decorative purposes. Any influence they had in retarding the shifting of teeth would have been purely coincidental.
2. The deliberate evulsion of teeth was fundamental to the process of providing a place to install these pontics, a pattern very different from the modern concept of preservative dentistry.

---

<sup>51</sup> Waarsenburg 1990; Becker 1999c.

<sup>52</sup> Johnstone 1932b, 448.

3. Only women wore these appliances, and perhaps only in southern Etruria.
4. Gold bands or braces that had no false teeth attached may have been employed for functional reasons, such as to prevent the movement or loss of teeth loosened by a blow or by periodontal disease.

## Acknowledgements

My most sincere thanks are due Dr. Jean MacIntosh Turfa and the many people who facilitated studies of Etruscan dental appliances at the museums where they are now found. Special thanks are due to Prof. L. Bliquez for sharing his extensive data during all phases of this research. Partial funding for aspects of this research was provided by a series of small travel grants awarded by the College of Arts and Sciences at West Chester University. The aid of Profs. D. McConatha and Martin Murphy is particularly appreciated. Thanks are due to the late Prof. Adele Ré and other Italian colleagues for help at various points in these studies. Thanks also are due to the Members of Congress of the United States of America for their support of tax laws that stimulate and encourage research in this and other areas of inquiry. The ideas presented here, as well as any errors of fact or interpretation, are solely my own responsibility.

## References

- Badre, L. 1986. "Machoire, No. 349." In *Les Phéniciens et le monde méditerranéen*, exhibition catalogue, edited by E. Gubel, 266. Brussels: C. Coessens.
- Becker, M. J. 1990. "Etruscan Social Classes in the VI Century B.C.: Evidence from Recently Excavated Cremations and Inhumations in the Area of Tarquinia." In *Die Welt der Etrusker. Internationales Kolloquium, October 1988*, edited by H. Heres and M. Kunze, 23–35. Berlin: Akademie-Verlag.
- . 1992a. "Cultural Uniformity during the Italian Iron Age: Sardinian Nuraghi as Regional Markers." In *Sardinia in the Mediterranean: A Footprint in the Sea*. Studies in Sardinian archaeology presented to Miriam S. Balmuth, edited by R. H. Tykot and T. K. Andrews, 204–9. Monographs in Mediterranean Archaeology 3. Sheffield: Sheffield Academic Press.
- . 1992b. "An Etruscan Gold Dental Appliance in the Collections of the Danish National Museum. Evidence for the History of Dentistry." *Tandlaegebladet (Danish Dental Journal)* 18(96): 599–609.
- . 1993. "Human Skeletons from Tarquinia. A Preliminary Analysis of the 1989 Cimitero Site Excavations with Implications for the Evolution of Etruscan Social Classes." *StEtr* 58: 211–48.
- . 1994a. "Etruscan Gold Dental Appliances. Origins and Functions as Indicated by an Example from Orvieto, Italy, in the Danish National Museum." *Dental Anthropology Newsletter* 8(3): 2–8.
- . 1994b. "Etruscan Gold Dental Appliances. Origins and Functions as Indicated by an Example from Valsiarosa, Italy." *Journal of Paleopathology* 6(2): 69–92.
- . 1994c. "Spurious 'Examples' of Ancient Dental Implants or Appliances." *Dental Anthropology Newsletter* 9(1): 5–10.

- . 1995a. "Female Vanity among the Etruscans. The Copenhagen Gold Dental Appliance." In *Actas del I Congreso Internacional de Estudios sobre Momias, 1992*, edited by A. C. Aufderheide, 2: 651–58. Santa Cruz de Tenerife: Museo Arqueológico y Etnológico de Tenerife.
- . 1995b. "Tooth Evulsion among the Ancient Etruscans. Recycling in Antiquity." *Dental Anthropology Newsletter* 9(3): 8–9.
- . 1996. "An Unusual Etruscan Gold Dental Appliance from Poggio Gaiella, Italy." *Dental Anthropology Newsletter* 10(1): 10–16.
- . 1997. "Early Dental Appliances in the Eastern Mediterranean." *Berytus* 42: 71–102.
- . 1998. "Etruscan Gold Dental Appliances. Evidence for Cultural Processes." In *Treating Illnesses. Historical Routes. 1st International Conference of Anthropology and History of Health and Disease*, 2: 10–21. Genoa: Erga edizioni.
- . 1999a. "Ancient 'Dental Implants'. A Recently Proposed Example from France Evaluated with Other Claims." *International Journal of Oral & Maxillofacial Implants* 14: 19–29.
- . 1999b. "Etruscan Gold Dental Appliances. Three Newly 'Discovered' Examples in America." *AJA* 103: 103–11.
- . 1999c. "The Valsiarosa Gold Dental Appliance. Etruscan Origins for Dental Prostheses." *Etruscan Studies* 6: 43–73.
- . 2000. "Reconstructing the Lives of South Etruscan Women." In *Reading the Body. Representations and Remains in the Archaeological Record*, edited by A. E. Rautman, 55–67. Philadelphia: University of Pennsylvania Press.
- . 2002. "Etruscan Female Tooth Evulsion: Gold Dental Appliances as Ornaments." In *Practices, Practitioners and Patients. New Approaches to Medical Archaeology and Anthropology*, edited by G. Carr and P. Baker, 236–57. Oxford: Oxbow.
- . 2003. "Etruscan Gold Dental Appliances. Evidence for Early 'Parting' of Gold in Italy through the Study of Ancient Pontics." In *Molecular and Structural Archaeology. Cosmetic and Therapeutic Chemicals*, edited by G. Tsoucaris and J. Lipkowski, 11–27. NATO Science Series 117. Dordrecht: Kluwer.
- . 2005. "Etruscan Women at Tarquinia. Skeletal Evidence for Tomb Use." *AnalRoma* 31: 21–36.
- . 2014. "Dentistry in Ancient Rome. Direct Evidence for Extractions Based on the Teeth from the Excavations at the Temple of Castor and Pollux in the Roman Forum." *International Journal of Anthropology* 29 (4): 209–226.
- Becker, M. J., and J. MacIntosh Turfa 2017. *The Etruscans and the History of Dentistry. The Golden Smile through the Ages*. Abingdon: Routledge.
- Becker, M. J., and L. Salvadei. 1992. "Analysis of the Human Skeletal Remains from the Cemetery of Osteria dell'Osa." In *La necropoli laziale di Osteria dell'Osa*, edited by A. M. Bietti Sestieri, 253–292. Rome: Quasar.
- Bliquez, L. J. 1996. "Prosthetics in Classical Antiquity. Greek, Etruscan, and Roman Prosthetics." *ANRW* 37(3): 2640–76.
- Böttiger, K. A. 1797. *Griechische Vasengemälde, mit archäologischen und artistischen Erläuterungen der Originalkupfer*, vol. 1, pt. 1. Weimar: Industrie-Comptoir.
- Casotti, L. 1947. "L'odontotecnica degli Etruschi." *Rivista Italiana di Stomatologia* 2: 661–78.
- Clawson, D. 1934. "Phoenician Dental Art." *Berytus* 1: 23–31.
- Corruccini, R. S., and E. Pacciani. 1989. "'Orthodontistry' and Dental Occlusion in Etruscans." *The Angle Orthodontist* 59(1): 61–64.
- Cozza, A., and A. Pasqui. 1981. *Carta Archeologica D'Italia (1881–1897). Materiali per l'Agro Falisco. Forma Italiae*, ser. 2, documenti 2. Florence: Olschki.
- De Puma, R. D. 1987. "Etruscan Gold Jewelry Techniques." *Field Museum of Natural History Bulletin* 58(9): 7–15.
- Deneffe, V. 1899. *La prothèse dentaire dans l'antiquité*. Anvers: Caals.

- Emptoz, F. 1987. "La prothèse dentaire dans la civilisation étrusque." In *Archéologie et médecine. VII Rencontre Internationale d'Archéologie et d'Histoire, Antibes 1986*, 545–60. Juan-les-Pins: Éditions A.P.D.C.A.
- Guerini, V. 1909. *A History of Dentistry*. Philadelphia: Milford House.
- Hoffmann-Axthelm, W. 1985. *Die Geschichte der Zahnheilkunde*, 2nd ed. Berlin: Quintessenz Verlag.
- Jackson, R. 1988. *Doctors and Diseases in the Roman Empire*. London: British Museum.
- Johnstone, M. A. 1932a. "The Etruscan Collection in the Free Public Museums of Liverpool." *Annals of Archaeology and Anthropology, Liverpool* 19: 121–37.
- . 1932b. "The Etruscan Collection in the Public Museum of Liverpool." *StEtr* 6: 443–52.
- Lanciani, R. 1892. *Pagan and Christian Rome*. Boston: Houghton, Mifflin. (Repr. New York: Benjamin Blom, 1967 [and other reprints].)
- Lufkin, A. W. 1948. *A History of Dentistry*, 2nd ed. Philadelphia: Lea & Febiger.
- Marvitz, L. 1982. "Tandlaegekunst." In *Etruskernes Verden. Livet og do/den hos et oldtidsfolk i Italien* [catalogue], 49. Copenhagen: National Museum of Denmark.
- Masali, L., and A. Peluso. 1985. "L'odontoiatria nell'antico Egitto." In *Storia della odontoiatria*, edited by G. Vogel and G. Gambacorta, 51–66. Milan: Ars Medica Antiqua Editrice.
- Pot, T. 1985. "Two Etruscan Gold Dental Appliances, Found in 19th Century Excavations at Satricum and Praeneste." *MededRom* 47: 35–39.
- Poulsen, F. 1927. *Aus einer alten Etruskerstadt*. Copenhagen: Bianco Lunos Bogtrykken.
- Riis, P. J. 1941. *Tyrrhenika. An Archaeological Study of the Etruscan Sculpture in the Archaic and Classical Periods*. Copenhagen: Munksgaard.
- Robb, J. 1997a. "Intentional Tooth Removal in Neolithic Italian Women." *Antiquity* 71: 659–69.
- . 1997b. "Violence and Gender in Early Italy." In *In Troubled Times: Osteological and Archaeological Evidence of Violence*, edited by A. O. Koslosku-Ostrow and C. L. Lyons, 43–65. New York: Routledge.
- Sudhoff, K. 1926. *Geschichte der Zahnheilkunde*, 2nd ed. Leipzig: Barth.
- Tabanelli, M. N. 1963. *La medicina nel mondo degli Etruschi*. Florence: Olschki.
- Waarsenburg, D. J. 1990. "Auro dentes iuncti. An Inquiry into the Study of the Etruscan Dental Prosthesis." In *Stips Votiva. Papers Presented to C.M. Stibbe*, edited by M. Gnade, 241–47. Amsterdam: Allard Pierson Museum.
- . 1995. *The Northwest Necropolis of Satricum. An Iron Age Cemetery in Latium Vetus*. Amsterdam: Thesis Publishers.
- Woodforde, J. 1967. *The Strange Story of False Teeth*. London: Routledge and Kegan Paul.