Quaternary International xxx (2016) 1–8

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

A reexamination of the Middle Paleolithic human remains from Riparo Tagliente, Italy

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ARTICLE INFO

Article history:
Available online xxx

Keywords:
Neandertal
Deciduous teeth
Micro computed tomography
Dental tissue proportions

ABSTRACT

Despite new discoveries of human fossil remains, some aspects of paleoanthropological research are biased by the poor sample size, which limits our understanding of intra-species variability among the different hominin species. In this context, continuous assessment and reassessment of human fossil remains discovered decades ago, and often unknown to the scientific community, represent an opportunity to address this issue. Moreover, deciduous teeth are less studied than permanent dentitions, an aspect which contributes to limit our understanding.

In the present study, we provide a detailed description of Tagliente 3 (upper right second deciduous molar) and Tagliente 4 (lower left deciduous canine), two deciduous teeth from Riparo Tagliente (Stallavena di Grezzana, Verona) attributed to *Homo neanderthalensis*.

In terms of morphology and size, Tagliente 3 presents typical Neandertal derived features (e.g., likely large hypocone and complex topography of the enamel-dentine junction). Although deciduous canines usually do not provide substantial morphologically diagnostic information, Tagliente 4 falls in the upper range of the Neandertal variability for its bucco-lingual diameter. In terms of tissue proportions both teeth fall within the Neandertal range of variation: Tagliente 3 for the enamel thickness distribution and Tagliente 4 for the volume of the crown dentine.

This work contributes to increase our knowledge on the variability of Neandertal deciduous dentition.

1. Introduction

Paleoanthropological research is often limited by the small size of available samples, which bias our understanding of human variability. There is a constant need to update and develop methodologies for the progress of this discipline. The discovery of new fossil remains plays an important role in the comprehension of taxon variability, but the assessment and reassessment of specimens already present in collection and "forgotten" by the scientific community represent a further opportunity. In some cases, very limited and sometimes imprecise information is available to the international scientific community (Benazzi et al., 2011b, 2011c, 2013a, 2013b, 2015).

This is the case of the two teeth, Tagliente 3 and Tagliente 4, which were brought to light in the Mousterian deposits of Riparo Tagliente (Stallavena di Grezzana, Verona, Italy) during excavations

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http://dx.doi.org/10.1016/j.quaint.2016.09.009
1040-6182/

directed by A. Guerreschi and C. Peretto (Bartolomei et al., 1982; Villa et al., 2001).

Although Riparo Tagliente is well known from the point of view of its lithic assemblages and faunal remains (Bartolomei et al., 1982; Blackwell et al., 1983; Alhaique et al., 2004; Arzarello and Peretto, 2005; Thun Hohenstein and Peretto, 2005), these two human specimens have only been published in the proceeding of a national congress (i.e. XIII Congresso dell'Associazione degli Antropologi Italiani, Villa et al., 2001), a report that is not easily available to the scientific community and which contains only a partial description of the human remains particularly focused on the microwear analysis. In this report, Tagliente 3 and Tagliente 4 were attributed to an upper second deciduous molar and an upper canine respectively. Villa and colleagues state that both remains fall in the average of Neandertal deciduous teeth in terms of dimensions but they do not provide any detailed morphological analysis (Villa et al., 2001); To our knowledge, Tagliente 3 and Tagliente 4 have never been considered in any dental studies.

Neandertals' deciduous teeth are less studied than permanent teeth for which numerous useful protocol have been developed (Bailey, 2004; Gómez-Robles et al., 2008; Benazzi et al., 2011a). Though permanent teeth have received more attention than deciduous teeth in the last years several contributions have started to fill the gap (Grine, 2005; Bailey and Hublin, 2006; Macchiarelli et al., 2006; Bayle, 2008; Bayle et al., 2009a, 2009b, 2010; Mahoney, 2010, 2013; Toussaint et al., 2010; Zanolli et al., 2010; Benazzi et al., 2012, 2014a, 2015; Macchiarelli, 2013; Fornai et al., 2014, 2016; Bailey et al., 2014a, 2014b, 2016; Hershkovitz et al., 2015; Weber et al., 2016). Nonetheless, further work is required to understand the morphological and morphometric variability of hominin deciduous teeth.

In this contribution, we present a reassessment of Tagliente 3 and Tagliente 4 human deciduous teeth through a detailed qualitative and quantitative description based on micro-CT imaging.

Our main aim is to bring Riparo Tagliente and the human remains it yielded to the attention of the scientific community. Moreover, we hope that our results will be useful to further comparative studies.

2. Riparo Tagliente

Riparo Tagliente (Stallavena di Grezzana, Verona, N–E Italy) lies on the west slope of Valpantena, one of the main valley-bottoms of the pre-Alpine massif of Monti Lessini, at an altitude of 250 m a.s.l. (Fig. 1a). The rock-shelter occupies a strategic position at the crossroads of different topographic formations – the plain, the valley-bottom, the rocky slopes and the top of the massif – matching a mosaic of landscapes rich in different faunal and vegetal resources, which have varied in distribution over time. The limestone nature of the massif favours the presence of several karst cavities and abundant lithic and mineral resources, namely a variety of cherts, which were extensively exploited by the inhabitants of the Paleolithic site. Discovered in 1958 by Francesco Tagliente, the site was initially investigated from 1962 to 1964 by the Museo Civico di Storia Naturale of Verona. In 1967 excavations were resumed by the University of Ferrara and are still in progress. Up to the mid-seventies research focused mostly on the excavation of a long trench running transversally to the rock-shelter and a smaller one located in the most internal area (Southern sector, Fig. 1d). A 4.50 m deep stratigraphic series was thus brought to light formed by two main deposits separated by a river escarpment: a lower one referred to MIS 4–3 occupation with Mousterian and Aurignacian assemblages and an upper one dated to the Late Glacial attesting a Late Epigravettian occupation (Fig. 1a and c). From the late '70s onwards extensive excavations were undertaken in the northern area of the site.

The Mousterian sequence, which represents the focus of this paper, begins with colluvial deposits and thermoclastic sediments (levels 52–44). This unit is covered by a massive rockfall and by clasts derived from the degradation of the walls of the rock shelter (levels 43–40). In the upper part (levels 39–31), loess sediments prevail. The human teeth Tagliente 3 and Tagliente 4 were recovered in levels 36βI-βII and 37bαII, respectively. At the top of this sequence and in apparent stratigraphic continuity level 25 contains an Aurignacian industry with Dufour bladelets.

Small mammals are mostly documented by dental remains (Bartolomei et al., 1982). The assemblage is dominated by *Microtus arvalis* in the whole sequence (except for level 25), with the presence of cold indicators such as *Microtus oeconomus*, *Microtus gregalis*, *Ochotona* sp. and *Sicista* sp. These species are replaced by *Chionomys nivalis* and *Apodemus* sp. in the upper layers (from 35 to 31) suggesting a less continental climate with an increase in low temperatures condition.

The majority of the large mammal remains analyzed from the uppermost Mousterian levels (41–35) consists of teeth, mandible fragments, limb elements, vertebrae, and sesamoids belonging to adults and sub-adults ungulates (Thun Hohenstein and Peretto, 2005). The most represented species is *Capreolus capreolus* followed by *Cervus elaphus*, *Capra ibex* and *Rupicapra rupicapra*; among carnivores, *Canis lupus* and *Ursus arctos* dominate; *Marmota marmota* remains have been identified among rodents. In the lower levels (44–52), the composition of the faunal assemblage remains unchanged among artiodactyls, while carnivores increase in the number and variety of represented taxa (*Canis lupus*, *Vulpes vulpes*, *Ursus arctos*, *Panthera pardus*, mustelids). The abundance of roe deer and the presence of elk and marmot may suggest a relatively cold-temperate and a rather humid climate. The presence of foetal or neonatal cervid bones indicates that Neandertals occupied the rock shelter mainly during the spring (Thun Hohenstein and Peretto, 2005). Cut-marks and intentional bone fracturing are well documented along the whole sequence, mostly on artiodactyls and on some marmot remains (Alhaique et al., 2004).

The Mousterian sequence is characterized by the use of different reduction methods, all on local raw materials (chert) collected in the surroundings of the site. The opportunistic method of reduction is the best represented (c.f. S.S.D.A, Forestier, 1993). The Levallois method (Boëda, 1994) is also present with the lineal and recurrent modalities. In the lower levels, centripetal recurrent Levallois is the most frequent, but in the upper part of the sequence, unipolar recurrent Levallois becomes dominant (Arzarello and Peretto, 2005). The discoid method (Boëda, 1993) is also attested especially in the final reduction phase of the Levallois cores. One of the main peculiarities of the lithic assemblage is the presence of a volumetric laminar debitage starting from level 37 (Arzarello and Peretto, 2005). The retouched assemblage is mainly represented by side-scrapers and denticulates made on opportunistic and more rarely on Levallois flakes.

So far no radiometric dating has been undertaken on the Mousterian stratigraphical sequence. However, the faunal assemblage and the sedimentological analysis suggest a chronology spanning between MIS 4 and MIS 3 (Bartolomei et al., 1982).

3. Materials and methods

3.1. Micro-CT scan

High-resolution micro-CT images of Tagliente 3 and Tagliente 4 were obtained with the Xalt micro-CT scanner (Panetta et al., 2012). All teeth were scanned at 50 kVp, 2 mm Al filtration, 800

Please cite this article in press as: Arnaud, J., et al., A reexamination of the Middle Paleolithic human remains from Riparo Tagliente, Italy, Quaternary International (2016), http://dx.doi.org/10.1016/j.quaint.2016.09.009