



PALEO

Revue d'archéologie préhistorique

30-1 | 2019

Varia

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Electronic version

URL: <http://journals.openedition.org/paleo/4631>

DOI: [10.4000/paleo.4631](https://doi.org/10.4000/paleo.4631)

ISSN: 2101-0420

Publisher

SAMRA

Printed version

Date of publication: 30 December 2019

Number of pages: 164-169

ISSN: 1145-3370

Electronic reference

Asier Gómez-Olivencia and Daniel García-Martínez, « New postcranial remains from the Roc de Marsal Neandertal child », *PALEO* [Online], 30-1 | 2019, Online since 29 May 2020, connection on 07 July 2020.

URL : <http://journals.openedition.org/paleo/4631> ; DOI : <https://doi.org/10.4000/paleo.4631>



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NEW POSTCRANIAL REMAINS FROM THE ROC DE MARSAL NEANDERTAL CHILD

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This paper presents the identification and study of three new human fossil remains belonging to the Neandertal child Roc de Marsal, found in the eponymous cave site, located near Campagne-de-Bugue, Dordogne, France. These three new fragments correspond to a right clavicle shaft fragment, a shaft fragment of the right radius and the dorsal part of a shaft fragment of hand (likely proximal) phalanx. These elements further complete the state of preservation of the skeleton. This work underlines the necessity to review “old collections”. We propose the hypothesis that additional taphonomic studies could, in some cases, allow discussion of certain skeletal representation.

PALEO 30 | t. 1
DÉCEMBRE 2019
PAGES 164 À 169

KEY-WORDS Mousterian, post-cranial, *Homo neanderthalensis*, anatomical identification.

Nouveaux restes infra-crâniens de l'enfant Néandertalien Roc de Marsal.

Cet article présente l'identification et l'étude de trois nouveaux restes fossiles humains appartenant à l'enfant néandertalien Roc de Marsal, trouvé dans la grotte éponyme, située près de Campagne-du-Bugue, Dordogne, France. Ces trois nouvelles pièces correspondent à un fragment de diaphyse de clavicule droite, de diaphyse de radius droit et d'une phalange (probablement proximale) de main. Ces différents éléments complètent le squelette. La présente étude souligne la nécessité de revoir les « anciennes collections ». Nous proposons l'hypothèse que la réalisation d'études taphonomiques complémentaires pourrait, dans quelques cas, permettre alors de discuter la représentation squelettique.

MOTS-CLÉS Moustérien, infra-crânien, *Homo neanderthalensis*, identification anatomique.

INTRODUCTION

Systematic revision of old archaeological collections housed at museums across Europe has led to the identification of new hominin fossils and has significantly increased the Neandertal fossil record in the last 20 years (e.g., Maureille 2002; Madeleine *et al.* 2008; Semal *et al.* 2009; Gómez-Olivencia *et al.* 2013, 2015, 2018; Maureille *et al.* 2015; Rougier *et al.* 2016). These new findings not only enlarge the available fossil record for paleobiological study but, when combined with taphonomic, radiometric, isotopic and ancient DNA analyses, they can provide new information on the biology and ecology of human populations of the past (e.g., Rougier *et al.* 2016; Gómez-Olivencia *et al.* 2018; Wißing *et al.* 2016, 2019).

The 18th of February of 2019 we carried out a revision of the indeterminate bone fragments associated with the Roc de Marsal (RdM) individual and identified three additional postcranial fragments that further complete this already very complete Neandertal child skeleton. We identified a shaft fragment belonging to the right clavicle, a shaft fragment of the right radius and the dorsal part of the shaft of a hand phalanx. The objective of the present paper is to provide a description of these new elements within the context of the discovery of this specimen.

1 | THE ROC DE MARSAL CHILD

The Neandertal child of Roc de Marsal was found on the 15th of August 1961 in a small cave near Campagne-de-Buge in the Dordogne region of France during the excavations performed by J. Lafille from 1953 until his death in 1971 (Lafille 1961; Bordes and Lafille 1962; Turq 1989). The skeleton was described as lying inside a pit of c. 90 x 70 cm in the bedrock floor. Bordes and Lafille (1962: 715), described the position of the skeleton as follows: "Une main était à hauteur du crâne dont la face regarde le sol, tandis que le thorax repose sur le côté droit. Les deux fémurs, sur un même plan horizontal, forment avec la colonne vertébrale, un angle de 135° s'ouvrant vers l'arrière; tibia et péroné sont à angle droit, vers l'arrière également, avec les fémurs.". Bordes and Lafille (1962) also speculate as to whether sediment pressure may have been partially responsible for this position. Moreover, they also indicate that during a period when the researchers were absent from the site, portions of the vertebral column, a scapula and some ribs were stolen, as well as some elements associated with the skeleton, including a hyena mandible and a long bone of a reindeer (Lafille 1961; Bordes and Lafille 1962). The skeleton seems to be associated with black sediments, while a yellow decomposed-sandy limestone layer covered the pit, including part of the cranium (Bordes and Lafille 1962). These authors suggest that the Mousterian people from layer V were responsible for the inhumation of this child's skeleton. The skeleton was extracted within a block and then excavated in the laboratory by a technician under the direction of Jean Piveteau.

Subsequently, Couchoud (2003) commented that the "pit" in the bedrock floor could have been a natural depression, similar to those observed in other parts of the cave, and which could have been used in an opportunistic fashion

by Neandertals to lay down the corpse of the child. New excavations were undertaken between 2004-2010 by a team directed by A. Turq and H. Dibble. Based on the new stratigraphic, sedimentological, and archaeological data, Sandgathe *et al.* (2011) cast doubts on the intentionality of the inhumation of this specimen based on similar observations as those previously suggested by Couchoud (2003), arguing that the “pit” could have been of natural origin. Sandgathe *et al.* (2011) further suggest that the completeness of the skeleton could also have been the result of natural processes, such as the death of the child during winter in a cold climatic phase which could have frozen the corpse until it was naturally covered by sediment. From a geoarchaeological point of view, Goldberg *et al.* (2017) did not find any clear geoarchaeological signs of anthropogenic ritual signature such as an intentional pit (as this individual was located in a natural karstic cavity) or the sedimentary context. However, Alain Turq, one of the co-authors of that study, disagrees with certain interpretations provided by the other members of the team (see Goldberg *et al.* 2017).

While there are some studies dealing with concrete aspects of the anatomy (e.g., Tillier 1983), the most complete study of this Neandertal individual was performed by Madre-Dupouy (1992), who thoroughly described the child’s skeleton in a monograph. Madre-Dupouy estimated an age-at-death interval between 30 and 48 months and a stature between 80 and 110 cm. Despite the young age of this individual, Madre-Dupouy (1992) clearly detected Neandertal characteristics in the skeleton of this individual in both the cranium and the post-cranium. Later, Bayle *et al.* (2009) estimated an age-at-death interval of 2.5-3 years for this individual, based on modern human standards. However, based on the Bayesian statistical analysis performed by these authors neither the deciduous nor the permanent mandibular sequences displayed by the RdM child were found in their reference sample, with the first molars being relatively advanced and the incisors relatively delayed in terms of their mineralization stages (Bayle *et al.* 2009).

2 | NEW POSTCRANIAL REMAINS

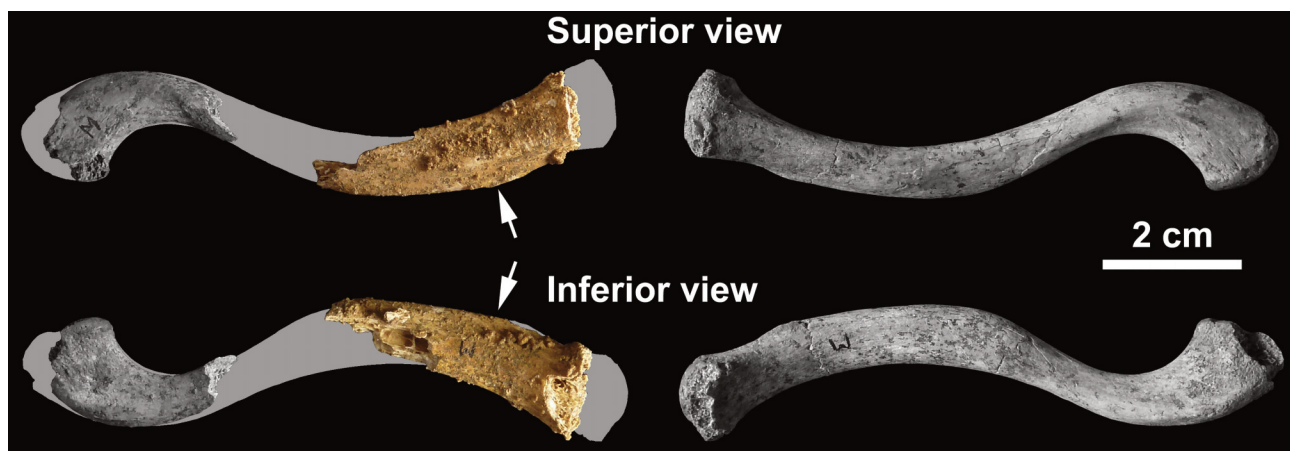
The RdM individual is housed at the Musée National de Préhistoire (Les Eyzies-de-Tayac-Sireuil, France) since 1984.

Clavicle

The left clavicle of the RdM individual is virtually complete with only minor erosion exposing the trabecular bone on both epiphyses. RdM also preserves a fragment of the right clavicle, with a maximum length of 28 mm, representing the acromial end (Madre-Dupouy 1992). We have identified a shaft fragment also belonging to this side, 36.8 mm in length that represents the sternal end, although the sternal surface is not present and the trabecular bone is exposed. The ventral edge of the shaft is well preserved and shows a well-developed attachment for *M. pectoralis major* (arrows in Figure 1). The dorsal edge of the bone is only preserved on the sternal-most 20 mm and lacks a bone chip, likely due to a recent breakage on the remaining c. 16 mm of this part. The morphology of this fragment is completely compatible with its antimer (fig. 1).

Radius

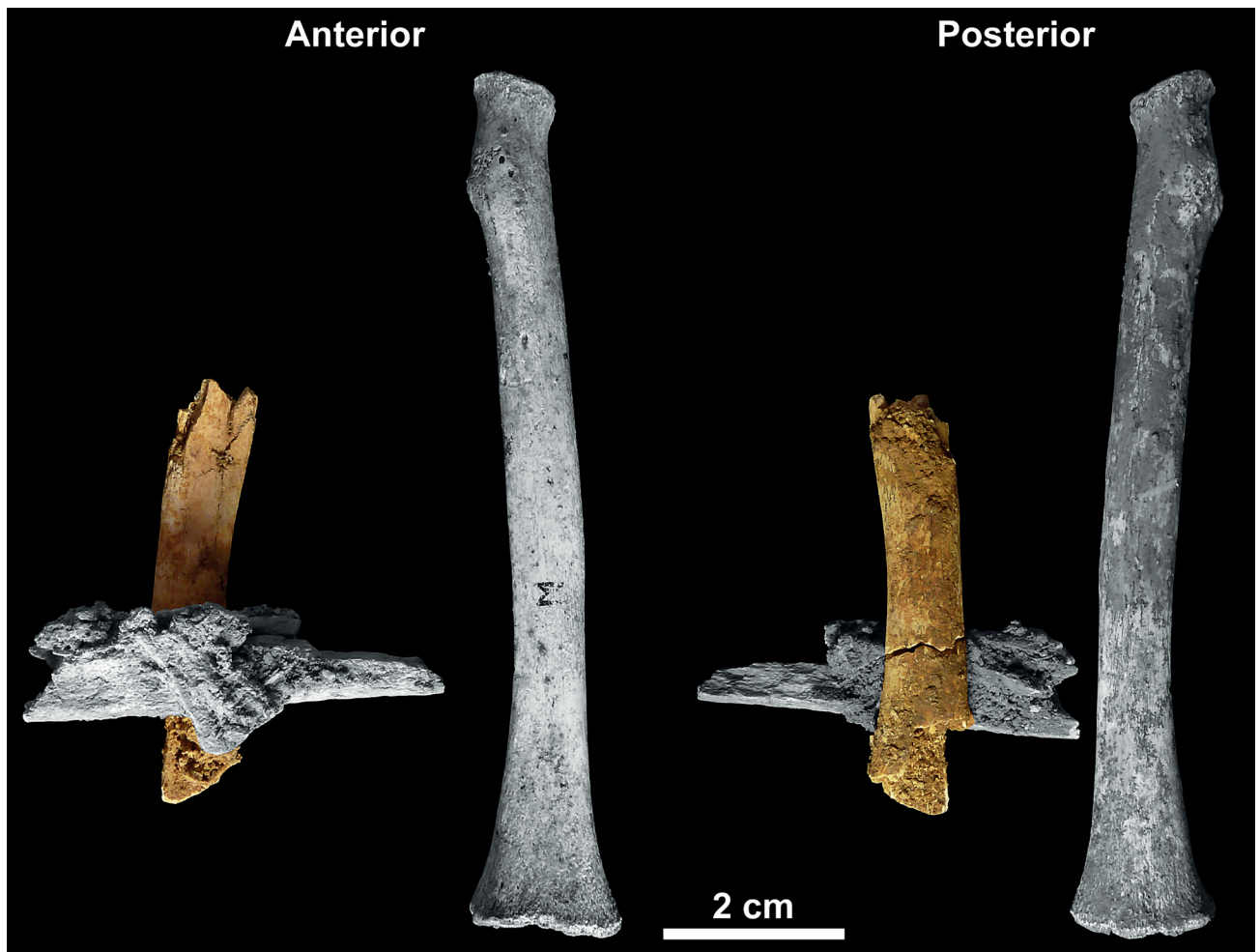
RdM preserves both left forearm bones, with the radius being complete and the ulna lacking part of the diaphysis close to mid-shaft. We have identified a shaft fragment of the right radius, with a maximum length of 44 mm, representing the mid-shaft, from slightly distal to the nutrient foramen (not preserved) to the beginning of the medio-lateral and antero-posterior expansion of the shaft towards its distal end (fig. 2). This region of the shaft is represented by two fragments that perfectly refit together and that show a recent break. The more proximal fragment shows some crushing on its proximal end and a bit of matrix adhering to its posterior surface (on a surface of 7.4 mm medio-laterally by 6.4 mm proximo-distally). This fragment preserves approximately the mid-shaft around 5 mm proximal to its distal-most end. The measurements of the shaft at this point (A-P: 5.0; M-L: 7.7 mm) are compatible with the measurements of the mid-shaft from



— FIGURE 1 —

The new fragment of the right clavicle (in colour) besides the known fragment of this clavicle (in grey) and compared to the complete left clavicle (in grey).

Le nouveau fragment de la clavicle droite (en couleur) à côté du fragment connu de cette clavicle (en gris) et comparé à la clavicle gauche complète (en gris).



— FIGURE 2 —

New right side radial fragments from the Roc de Marsal child (in colour) in anterior (left) and posterior (right) views compared to the complete left radius of this individual (in grey). The two new fragments perfectly refit, but the most distal one is still attached to sediment with faunal bone splinters.

Nouveaux fragments du radius droit de l'enfant du Roc de Marsal (en couleur) en vues antérieure (à gauche) et postérieure (à droite) et de son radius gauche complet (en gris). Les deux nouveaux fragments remontent parfaitement. Le plus distal est collé à des sédiments avec des fragments d'os de faune.

the left side (A-P: 5.4; M-L: 7.9 mm). The other fragment is still partially covered with matrix on its anterior surface, which also contains some other bone (likely fauna) splinters. The ventral/anterior part of this fragment is more complete than the dorsal part and the trabecular bone is exposed on its interior surface.

Hand phalanx

A shaft fragment, preserving the dorsal (concave) surface of a likely proximal phalanx has been identified (fig. 3). The medio-lateral width of the fragment (6.4 mm) and exclusion criteria based on the preserved phalanges of this individual indicates that it could belong to finger 2-3 from the left side. First, it is too wide to belong to digits 1 or 5. Second, the preserved length (14.0 mm) would further exclude it as a digit 1. The external surface is smooth and similar to other phalanges of this individual. The internal view of this individual shows a smooth surface on the centre of the fragment and trabecula on both edges, particularly on the proximal end.

DISCUSSION

In this study we describe three new fossil remains belonging to the Roc de Marsal Neandertal child which further complete this skeleton. This discovery provides the opportunity to further discuss some aspects about the debate regarding whether RdM is the result of an intentional interment by Neandertals. In any case, geological observations have provided evidence that the “pit” in which the skeleton was found, is actually a natural feature observed in other parts of the cave (Couchoud 2003; Sandgathe *et al.* 2011). If intentional, then Neandertals used a natural depression and then covered the corpse with sediment, although part of that sediment was washed away exposing the cranium which is associated with a different kind of sediment (see Alain Turq's interpretation in Goldberg *et al.* 2017). Alternatively, the corpse of the child ended up by natural causes in this geological feature which further prevented its disarticulation (Sandgathe *et al.* 2011).



FIGURE 3

Comparison of the new phalangeal fragment (left) to one of the proximal phalanges assigned to the left hand (right).

Comparaison du nouveau fragment de phalange (à gauche) avec l'une des phalanges proximales de la main gauche (à droite).

The completeness of the skeleton of Roc de Marsal was part of this debate (see Sandgathe *et al.* 2011; Goldberg *et al.* 2017). Sandgathe *et al.* (2011:250) report that “the most obvious missing portions are the lower extremities (left tibia-fibula and both feet)”. Moreover, “Based on the inclination of the cavity and the orientation of the body, the lower legs, and particularly the left leg, would have been the most exposed portions of the body.” (Sandgathe *et al.* 2011:250). Based on this absence the authors propose that the absence of these elements is likely due to scavenging, “but in any case, it suggests that the body was probably not completely covered, if at all, after it initially entered the cavity” (Sandgathe *et al.* 2011:250). In contrast, Madre-Dupouy (1992) reports the presence of a left tibia, a possible left fibula, a talus (now lost) for which only a few photographs are preserved (“La pièce a été perdue. Il n’en reste que des photographies sur lesquelles l’échelle n’est pas précisée.”; Madre Dupouy 1992: 228), as well as four left metatarsals. Thus, the information provided by Sandgathe *et al.* (2011) regarding the completeness of the skeleton is incorrect and the RdM child is more complete than what they reported. Moreover, it should be kept in mind that some bones belonging to the skeleton were stolen (Lafille 1961; Bordes and Lafille 1962).

Additionally, in our assessment of the indeterminate fragments associated with the skeleton, we found other additional small bone fragments that could have potentially belonged to RdM such as small shaft fragments that could have belonged to a fibula and small fragments that could have belonged to the sacrum. Due to the impossibility to positively identify them we decided not to include them in this study. In our view, the absence of

the left tibia and fibula and foot bones seems to be related to post-depositional and recovery factors that should also be hypothesized (or at least taken into account) in order to properly assess the origin of the preservation/bias in the skeletal representation. Post-depositional factors may destroy bone fragments that are within an articulated skeleton, and the excavation of articulated skeletons does not guarantee the complete recovery of the skeleton, as some elements may not be identified as human bone. These two factors, individually or combined, will result in a bias and missing elements in otherwise very complete skeletons. One example would be the skeleton of La Chapelle-aux-Saints 1 which shows missing vertebrae (Boule 1911-13; Gómez-Olivencia *et al.* 2013) and for which additional skeletal elements have been identified in more recent excavations (Rendu *et al.* 2014). Finally, further progress or resolution of this debate necessitates additional taphonomic/forensic analysis on the Roc de Marsal Neandertal child, similar to those performed by done by Rendu *et al.* (2014, 2016) for the La Chapelle-aux-Saints 1 individual, by Gómez-Olivencia *et al.* (2018) for the La Ferrassie 1 individual and latter suggested by Goldberg *et al.* (2017) for Roc de Marsal Neandertal child.

ACKNOWLEDGEMENTS

We would like to thank to C. Cretin, J.-J. Cleyet-Merle, P. Jaquement, S. Madeleine (Musée National de Préhistoire) for the permission, access and technical support during our stay in Les Eyzies. We would like to further thank to the research groups from PACEA, University of the Basque Country and the Paleoanthropology group from the MNCN-

Madrid for fruitful discussions, and to Bruno Maureille for his comments that helped to improve this paper. Rolf Quam reviewed the English for the final draft. This work was supported by the Research Groups IT1418-19 (Eusko Jaurlaritz-Gobierno Vasco), and by the Spanish *Ministerio de Ciencia, Innovación y Universidades* (project PGC2018-093925-B-C33). Ago is funded by a Ramon y Cajal fellowship (RYC-2017-22558) DGM was funded by the IdEx University of Bordeaux Investments for the Future program (ANR-10-IDEX-03-02).

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