Bioarchaeology in Senegal: State of the art and new perspectives in dental anthropology

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Abstract. In this article, we focus on the evolution of bioarchaeology in Senegal and the relevance of the involvement of dental anthropology in this emerging sphere. In Senegal, bioarchaeology was first introduced as part of the doctoral program: reconstructing postcolonial anthropology in West Africa, conducted since 2017 by URICA. The investment towards this discipline was necessary because, in this country there is almost no bioarchaeologists and dental anthropologists. After the "expedition" of the physical anthropologist, Guy Thilmans, the human remains from Senegalese archaeological sites are sent abroad or kept at the *Laboratoire Préhistoire et Protohistoire of IFAN Cheikh Anta Diop* in Dakar. The objective of this article is to review the achievements, shortcomings and possible new perspectives of Senegalese bioarchaeology. Thus, we will review funerary archaeology and diagnose the studies of human remains known to date in Senegal. In our analysis we will refer to the recognized funerary ensembles: megalithism, earth mounds, shell mounds, baobabs known as griots, and the funerary sites of Senegal River Valley.

Key words: bioarchaeology, dental anthropology, perspectives

Introduction

Senegalese archaeology has gone through three main phases, a colonial archaeology that was conducted by colonial administrators. With the achievement of African independence, IFAN became the Institut Fondamental d'Afrique Noire, centralized around the Laboratoire Préhistoire et Protohistoire, an archaeology and physical anthropology that tended to reproduce colonial procedures. It was only in the 1990s that the American school, under the influence of New Archeology, proposed the processual approach. This approach prevailed until the year 2000. From that moment on, Senegalese archaeology opened up to new currents and approaches of post-processual and decolonial archaeology. It is under this angle that multidisciplinary research institutes, such as URICA, were set up and aimed at deconstructing colonial archaeology and anthropology. This research unit integrated, for the first time in Senegal, historical bioarchaeology. This discipline brings something new to these processes of deconstruction of colonial influences because it offers the possibility of being in direct contact with the evidence of the conditions, ways of life and life courses of the formerly colonized communities. It is therefore necessary to evaluate the state of "bioarchaeological" research in Senegal: What has been done so far ? How have the studies been conducted? What are the possible perspectives ? Addressing these questions will help provide a useful synthesis of the work that has been done, and to propose openings to lesser-known disciplines such as dental anthropology. Our article aims to analyze the Senegaese bioarchaeology, its achievements and future perspectives by reviewing the studies

of funerary archaeology and human remains. Thus, the present research will focus on analyzing the funerary sites from the Senegal River Valley, megalithic monuments, earth mounds, shell mounds, and baobabs.

Methodology

One of the main methods adopted for this article is a critical review of archaeological work in Senegal. The aim has been to review the productions of this region and to extract all data relating to the discovery, description and study of human remains. This examination is combined with direct or collective observations of the valley's osteological collections, which are kept at the Prehistory and Protohistory Laboratory of IFAN Cheikh Anta Diop in Dakar. In addition, most of the proposed perspectives are based on the results of our current thesis on the reconstruction of the life history of human remains from Doogal, a funerary site in the Middle Senegal River Valley.

Results

The megaliths and its human remains: State of the art

The practice of burial beneath megalithic monuments was recognized in West Africa as early as the second half of the first millennium CE (Thilmans & Descamps 1980; Gallay et al., 1982; Thilmans & Descamps, 1982; Gallay, 2006; Holl, 2021). These megalithic monuments exerted the interest of non-professionals from the colonial administration who, despite their methodological and ethical problems, made it possible to confirm the funerary function of the megaliths (Thilmans & Descamps 1980; Gallay et al., 1982; Thilmans & Descamps, 1982; Holl, 2012) (Figure 1).

However, it should be noted that, from 1903 to 1930, the rare remains collected from the megalithic circles were only subject of descriptive studies that mainly led to a racial categorization based on cranial features. Guy Thilmans (1980) has made a complete review of these works: in 1904, E. T. Hamy studied a human skull excavated by R. Du Laurens in 1904 at

Figure 1. View of a megalithic site: megalithic circle I of Wanar; photo credit, Jean-Paul Cros (2013).

Maka and concluded that this skull presents "negro" typology. But Guy Thilmans (1980), who reports this information, does not specify the nature of these so-called "negro" characteristics. The following year, 1905, the bones excavated on the Dialato site by another European, Captain L. Duchemin, again showed so-called "Negro" features.

Around 1911, excavations of another megalithic circle at Lamine-Koto by J. L. Todd and G. B. Wolbach brought to light the human remains from a dozen burials, two skulls and teeth. This collection was turned over to A. Keith for examination and his study concluded that these skulls also had "Negro" typology. In 1916, J. P. Boutonnet, a colonial administrator, excavated a human skeleton in the megalithic circle of Boulembou, but few details are provided about this human skeleton, found at a depth of nearly 2m. Fourteen years later, in 1930, the study of a skull excavated by P. Jouenne, was published with the conclusion that the skull presented "Negro" characteristics.

Fortunately, with the advent of African independence in the 1960s, this megalithic heritage could at least be analyzed by professional archaeologists and anthropologists. Since then, in the 1970s, megalithic funerary sites exerted the interest of G. Thilmans (1975) and a team from IFAN Cheikh Anta Diop in Dakar. Thilmans was a Belgian physical anthropologist recruited by the laboratory of Prehistory and Protohistory at IFAN Cheikh Anta Diop in Dakar. Between 1973 and 1975, he undertook the excavation of the Tiékéné-Boussoura site, where he worked

on five megalithic circles. A brief description of the osteological collection of burials from circle IV allowed G. Thilmans to note that skeleton two, located at a depth of 113cm, presented a pronounced dental wear.

Consequently, Thilmans believes that this individual is older than the second individual, located a little further up. On the other hand, it should be noted that dental wear alone is a weak determinant of age. It can be the result of dental pathologies, linked to mastication etc. In addition, the excavation of circle VI brought to light two burials and two skeletons. According to G. Thilmans, the superficial skeleton is a non-adult subject. However, he does not specify the discriminating characteristics that would make it possible to be sure.

As for circle VIII, it yielded two burials, the second one, which was located in the center of the circle, had negro features. The analysis of its iliac bones leads to the hypothesis that it is a male subject. By analyzing the length of the tibia, his height is estimated to 183.5cm. Both the age and height estimations are only based on tibia. The excavation of circle IX uncovered six burials, the estimated age of the skeleton four allowed G. Thilmans to conclude that this individual was about 11 years old, without specifying further details. In addition, based on the degree of dental wear, he estimates that skeleton five was the oldest of the six. By analyzing the femural length, Thilmans (1980) adds that the height of one of the three superficial skeletons is 176.5cm. But the estimates based on a single bone seem to be abusive, as this bone alone is not very representative to provide a hypothesis on the height of an individual. Also, the dental wear, is a variable which depends on more factors such as lifestyle, diseases, etc. In the case of circle X, from the same site, it contained two skeletons, but only skeleton two, the best preserved, has been studied.

A region of the skull cap of this individual allowed G. Thilmans to suppose that this individual was a middle-aged adult male, of "negro" race, with an elongated skull and a strong bone structure. His height, estimated from the tibia, was 181cm. According to the degree of dental wear, the deeper-located skeleton would be the oldest. But we find all these interpretations too ambitious because they are generally based on single bone and not very representative to allow conclusions regarding the "race" of the individuals. Each of the stone circles XVIII and XIX contained a single burial. In the case of the burial located in the center of circle XIX, Thilmans observed a low degree of dental abrasion, and concluded that this individual, although an adult, was not old.

During 1975-1976, G. Thilmans' team redirected its research to the megalithic site of Sine Ngayenne (Thilmans & Descamps 1974; Thilmans & Descamps, 1975). The teeth from the excavation of circles XXV, XXVIII and XXXII of this site were the subject of B. Khayat's thesis in dental surgery (1977). This study involved 1075 permanent teeth and about 20 temporary teeth. B. Khayat specifies that the estimation of the age of these remains, weakly preserved, was only possible by analyzing the teeth. But, if these teeth are the most important remains of the collection, one may wonder why this collection was not returned to Senegal. For estimating the age, B. Khayat proceeds as follows: for non-adults, the dental age is evaluated from the stages of dentition and for adults three variables have been set up, dental wear, dental loss and pathologies.

However, nowadays, the method of estimating the stages of dental age has evolved a lot and it takes into account the different stages of the evolution of the dentition, from calcification to complete eruption (Buikstra & Ubelaker, 1994). Attrition and pathology are variables that vary and depend not only on age, but also on the environment, the individual's diseases, diet, genetics, etc. Despite its limitations, this estimation of the dental age of the remains from these three circles of Sine Ngayenne comes to the following conclusions: the best represented group from these three circles is that of adults (26-55 years), with similar frequencies (50-59%) from one monument to another. In addition to estimating the dental ages, B. Khayat had performed dental measurements and studied the anomalies of the dental volumes. The assessment of the 1075 permanent teeth is based on two variables, the mesio-distal and vestibulo-lingual diameters. One may wonder why these variables were chosen.

The comparison between these results and the dentition of the Neolithic populations led to the conclusion that the coronal dimensions of the Neolithic populations and those of the Circle III group are identical. When comparing with the present Sudanese population, B. Khayat notes important dental differences

with the Sine Ngayenne population, concluding that the teeth unearthed at this site are large. He has found five cases of macrodontia and four cases of microdontia in the teeth of these individuals. B. Khayat also made a study on the non-metric dental features. This study notes that the shovel shaped teeth, also practiced by Europeans, are frequent. Today, these non-metric features have a wide distribution in Africa and outside this continent.

Furthermore, B. Khayat mentions that teeth from Wolof populations, living in the present village of Sine Ngayène, have been studied for comparison with teeth from the Sine Ngayène site. The conclusion of this comparative study is that, unlike the megalithic teeth, the spade incisors of these Wolofs are more frequent on incisors one and two. However, no protocol was presented for the study of these teeth of the so-called Wolof populations. Moreover, the fact that these populations speak the Wolof language does not necessarily make them a separate group. The second identified feature is the coronal groove, which is found on the upper lateral incisors and it can be unique, associated with a cingular dimple or simply double. As for the cuspid variation of the upper molars, it was found on both the teeth of the remains from the circle III of Sine-Ngayéne and on the teeth of the Wolof populations. Furthermore, it was found that the cuspid variation of the molars of these populations is identical with those found on the dentition of the archaeological populations of Sine Ngayenne.

In the same way, Carabelli's tubercle is frequently found in the dentition of both groups, the present and the archaeological populations. B. Khayat did not only base his study on dental morphology, he was also interested in pathologies: 8 % of the 1075 teeth from the circle III of the Sine Ngayenne site present dental caries, mostly on the occlusal faces. Although this pathology is not very prevalent, a classification and categorization of caries was possible based on the shape and location of the tooth decay (Buikstra & Ubelaker, 1994). In addition, a 9% antemortem dental loss was noted and 75 skulls showed dental wear. Regarding dental mutilations, it was observed in 82% of the upper central incisors.

In 2001, A. Holl and H. Bocoum initiated a regional focused to the Petit-Bao-Bolon watershed. They excavated the sites Sine-Ngayene, Ngayene II, and Sinthiou-Ngayene Sabakh (Holl & Bocoum, 2006 ; Holl, 2012). This work has expanded our knowledge on the chronology of megalithism, the presence of secondary burials being largely predominant in the three excavated sites. Early single and multiple primary burials are certainly present, but they are generally found in the earthen mound (Holl, 2012). Bioarchaeologically, information on individuals from these burials is relatively scarce, if it exists at all, since this program is focused more on the funeral architectures and modes.

In 2007, L. Laporte began a project on the megalithic site of Wanar. This project is described, in comparison with the regional project of the Petit-Bao-Bolon watershed, as "the study of a site" by A. Holl (2012). Between 2007 and 2009, and like previous work, this project focuses primarily on a reconstruction of the architecture of the monuments at the Wanar site (Holl, 2012; Cros et al., 2013). However, the leader of this project L. Laporte, A. Gallay and J.P. Cros decided, in 2013, to re-examine the data from the megalithic sites and they formulated important hypotheses on the funerary modes of the megalithic sites.

One of the major hypotheses that came out of this reflection is that, in addition to the hypothesis of G. Thilmans, the funerary mode around the megalithic monuments is heterogeneous: first it is possible that there were "houses of the dead" around the main or deep burials, and then, multiple burials of two individuals simultaneously put together can be understood as a wife and husband, mother and child, etc. (Cros et al., 2013).

To further understand the hypothesis of the presence of sacrificial or accompanying deaths, L. Laporte (2018) did not hesitate to seek answers from the ethnographic side, the result of his ethnographic research concluding: "in the lacunar state of the available archaeological documentation, the existence of human sacrifices can not be definitively ruled out. Nevertheless, the hypothesis of deaths of accompaniment remains valid" (Laporte, 2018). But it is only in recent years that bioarchaeology has begun to find its place in this program and the results of these studies are eagerly awaited.

In conclusion, we note that the studies of the megalithic funerary sites were carried out in two

phases: first by amateurs and then, after independence, by researchers whose objectives were more coherent. The work of the latter is not without problems. We have the impression that they tried to understand the populations buried in these funerary architectures without them. From an anthropological point of view, we do not know much about these individuals, the bones from the monuments are rarely studied, and, if not published, are rarely known to the general public or to researchers. Analyses are generally focused on understanding the burial modes and social identities of human individuals. Moreover, the hypotheses that presume the presence of "sacrificial dead" or "accompanying dead" cannot be confirmed only through ethnography since the local populations tend to deny any relationship with the megalithic sites. The study of the remains of these monuments is generally limited to the identification of the individuals' profiles and to conclude with "racial" interpretations.

Human remains from Tumulus coquilliers: Reviews and perspectives

The building of the shell mounds is dated between the early 1st millennium CE and the second half of the 2nd millennium CE (Hardy et al., 2016; Camara et al., 2017). One of the first excavations carried out at these burial sites corresponds to that of J. de Saint-Seine, in 1939, and they were carried out on the tumulus of Diorom Boundaw, west bank of Bandiala (Hardy et al., 2016; Camara et al., 2017). Based on the discovery of human bones, ceramics, two spearheads, and a bracelet, this first study would have confirmed the anthropological and funerary character of the shell mounds (Thiam, 1991; Hardy et al., 2016).

Following this study, T. Monod (1939), Bessac (1953) and Mauny (1957) had to carry out excavations on shell mounds, but it was not until 1965 that Olga Linares de Sapir, from the University of Pennsylvania, initiated more elaborate excavations on the shell mounds of the Lower Casamance (Chavane, 1976; Hardy et al., 2016). Moreover, O. Linares de Sapir (1971), is one of the first researchers to introduce and conduct the processual approach in West Africa. Later, this approach will be followed by the MacIntoshs (Richard, 2007).

But it is necessary to wait for the studies of G. Thilmans and C. Descamps, between 1971 and 1973, for a better understanding of the funerary character of the shell heaps. The latter undertook excavations on three shell mounds discovering nearly 149 burials (Thilmans & Descamps, 1982; Hardy et al., 2016; Camara et al., 2017). In addition, in 2000, on the occasion of a film production by L. Gavron, excavations, conducted by a team from IFAN Cheikh Anta Diop (G. Thilmans, C. Descamps, H. Bocoum etc.), were carried out at Djouta, Thioupane Boumak and Falia (Camara et al., 2017).

As in the case of megalith burial sites, the studies on shell mound funerary sites have focused on analyses that aimed to understand the monuments, the funeral modes and its chronology. The life paths, conditions and lifestyles of these populations have rarely interested the researchers. Of course, the study of these aspects requires a fairly good conservation of the remains, but the absence of bioarchaeologists or biological anthropologists in Senegal means that the remains are rarely studied. This is the case for the remains recently excavated on the Gandoul shell mounds by Michel Waly Diouf (2019) (Figure 2).

The Tumulus de terre and its human remains: Achievements and perspectives

Like the shell mounds, the earthen mounds represent burial sites, and its construction is dated between the second half of the 1st millennium CE and the

Figure 2. View of *Tumulus Coquilliers* in the Saloum of Senegal; photo credit, Michel Waly Diouf (Diouf, 2019).

beginning of the 2nd millennium CE (Bocoum, 2000; Magnavita & Thiaw, 2015) (Figure 3).

They were excavated as early as the 1940s. Between 1941 and 1942, Joir and Duchemin excavated earthen mounds at Massar and Ngigeela (Bocoum, 2000). At Ndalan, in 1971, IFAN researchers G. Thilmans and C. Descamps conducted an excavation that led to the discovery of human bones (Bocoum, 2000). Following this work, researchers A. Clos-Arceduc (1962), V. Martin and C. Becker (1974 and 1977) became interested in the inventory of burial sites. In 1993, an attempt by the MacIntoshs to search for habitat sites around the Kaél area burial mounds was unsuccessful because the sandy environment decreased the visibility of the archaeological sites (Magnavita & Thiaw, 2015).

To circumvent this constraint, a new remote sensing method was initiated on the earthen mounds of Kaél and its surroundings. This program, conducted by a German team - Madina, and Thiekene - uncovered burial sites in the area. As a result of these discoveries, the excavation of the Kaél site yielded burials located at 2.6m depth (Magnavita & Thiaw, 2015). The skeletons from this survey were studied in situ by the anthropologist J. Hansen. The poor preservation of the bones allowed only a general study of the bones. Sex determination was not possible in any of the cases. Teeth were used to establish the individuals' age, individual one is surely between 30 and 40 years old, the other individuals are between 18 and 24 years old (Magnavita & Thiaw, 2015).

Figure 3. View of a *Tumulus de terre* at Mbacké; photo credit, Luc Laporte 2018.

Finally, from a bioarchaeological point of view, the studies of the remains from the earthen mounds are limited, to our knowledge, to age and sex assessment. Ancient DNA, the study of lifestyles, subsistence strategies, etc., could help us understand various aspects of the history and life course of these populations. This means that, just like megalithic burial sites and shell mounds, earthen mounds have uncovered burials, but the bones are rarely studied and interpretations are generally focused on social identities. The new method of this German program is important because it allows the discovery of new burial sites in the region by using geophysical prospecting, underground remote sensing.

The "griot baobabs" and their human remains: Diagnosis and new directions

Like other funerary complexes, baobabs were also the object of burials, but these funerary sites were less popular than the megalithic monuments and the tumuli (Figure 4).

The funerary practice of burying in baobab trees, is said to have been known in Senegambia as early as the 15th century CE (Dapper, 1686; Almada, 1842). As early as 1955, R. Mauny and a team from IFAN collected nearly 20 skulls and other human bones from a baobab cemetery discovered in Dakar (Mauny, 1955). Following R. Mauny, G. in 1965, Thilmans started a massive collection of human bones from the baobabs that were used as tombs (Fig. 4). Within three months he succeeded collecting nearly 693 bones from nine baobab trees (Gallay, 2006).

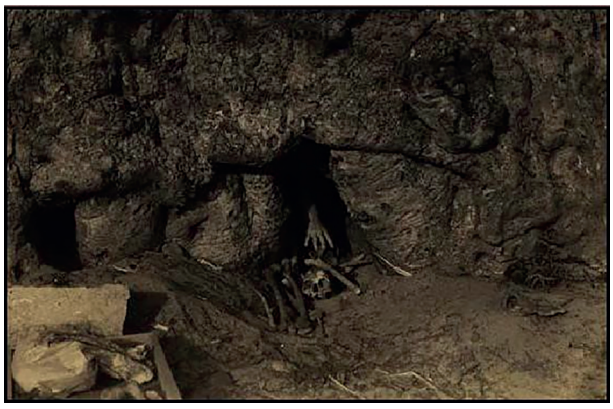

Figure 4. Collection of bones in a Baobab-cemetery (Badji, 2017).

Obviously, these studies carried out by G. Thilmans pose real ethical problems since the remains were often stolen. It was not until 2017 that a "more orthodox" project was initiated around the so-called griot baobabs. It is first a master's thesis conducted in 2017 by L. Badji and then his ongoing thesis under the URICA program. L. Badji's (2017) work expanded the mapping of cemetery baobabs. He inventoried 16 baobabs in Siin and Baol (Badji, 2017). The hollows of the baobabs were used as burial sites for lepers, but the absence of a regional study does not facilitate an understanding of this burial method. As a result, a relational approach between the groups practicing this form of burial could make it possible to detect its different forms, practices and attribution. It is certain that at present, the historical processes at the origin of this funerary rite are not known enough to draw conclusions. As far as bioarchaeology is concerned, to our knowledge, only the studies of G. Thilmans and M. R. Ndiaye have been carried out on the human remains of baobab trees with griots.

G. Thilmans published: "A study of some Lebou skulls (Senegal), IFAN bulletins, series B, N4, 1968". In this study, he examined the skulls from two baobabs in Dakar: the baobab known as "bok" which was at Fann and excavated by R. Mauny in 1955, and another baobab which was cut down in 1959 and which stood on the road to the airport in Yoff (Thilmans, 1968). At the beginning of this work, Thilmans attributed these skulls to the Lebou, under the pretext that Fann and Yoff are located in the territory of this community and he believed that it was under the influence of Islam that the Lebou people abandoned this funerary rite. Once again, this assumption was made without a solid scientific basis. As for Mame Rouba Ndiaye's study on the mandibles from the griot baobabs, it focused on the measurement of a few mandibles preserved in the archaeology laboratory of IFAN Cheikh Anta Diop in Dakar. The results of this work gave us an idea of the biological identity of these populations.

Ultimately, this review shows, apart from the ethical concerns largely developed by L. Badji (2017), that the studies focused on these baobab cemeteries lead to more identity questions. Therefore, they only answer negligible questions about the life and living conditions of the individuals buried in these baobab cemeteries. Thus, in the future, bioarchaeology could answer questions related to the illnesses, lifestyle, and even the violent traumas that these individuals may have suffered. Furthermore, it should be noted that the collection from the baobab trees kept at the archaeology laboratory of IFAN must be exhaustively inventoried. An important part of this collection would have been lent to the anatomical laboratory of the Faculty of Medicine of the University of Dakar by G. Thilmans. A thorough inventory could provide the exact number of individuals from the griot baobabs available at UCAD and allow considerable work on the archives of G. Thilamans to reconstruct the context of the origin of these remains. L. Badji's dissertation will surely allow for a reorganization and recontextualization of the collections from the "griot baobabs".

The senegal river valley and its remains, state of the art

The first research of the Senegal River Valley archaeological sites, conducted by non-professionals of the colonial administration, have started at the beginning of the 20th century CE: B. de Mézières (1915), Vitard (1954), Bessac (1964), etc., (Bocoum, 2000). It is here that À. Bonnel de Mézières conducted an excavation (in 1928) on a mound located east of Soubalo-Mboumba village, on the north bank of Doué River. At the time, he was looking for the tomb of Abu Dardai (Bocoum, 2000). According to G. Thilmans, Abu Dardai is a semi-legendary character who is said to have propagated Islam in the region (Thilmans et al., 1980). B. de Mézières had information from Colonel Gaden that the tomb of Abu Dardai was located near the village of Mboumba. But the bones from this excavation are very poorly preserved (Thilmans et al., 1980). After this work, the archaeology of the Senegal River Valley turned towards reconstructing the chronology, identity and settlement patterns. Henceforth, the emphasis is better placed, mainly, on material culture instead of ecofacts. As a result, the human, archaeological populations responsible for the establishment of the many habitat sites in this region are unknown. Nevertheless, most of the excavated sites have uncovered burials that we will review.

In 1958, after the archaeological research of colonial non-professionals, an accidental discovery in Podor revived the archaeology of the Senegal River

valley. Excavations, more or less professional, were initiated in this region. It is within this framework that G. Thilmans and A. Ravisé undertook a series of excavations on the site of Sincu Bara. The test pits carried out by this team on the eastern periphery of the rocky area has led to the discovery of some burial sites that contained extremely degraded and fragmentary human remains of three individuals, isolated bone pieces and 18 teeth. The teeth were described as follows: the M2 were on the arch, but the absence of the interproximal attrition facet shows that the M3 (not found) had not erupted. The apexes of M2 are not closed, and the degree of dental wear of all teeth is very low.

This dentition must have belonged to an individual who was about 13 years old. In addition, there are two dental caries on the distal surfaces of the M1. Furthermore, on the western periphery of the Sincu Bara site, four test pits were dug. These test pits yielded two individuals who were buried side by side and parallel to each other. For G. Thilamans and his team, it is probably a woman and a man of mature age and of negritic race. These physical considerations strongly used by the colonists do not exist anymore and are based on racist theories. Moreover, in the present case G. Thilmans bases himself on the characteristics of the chin to define the Negro racial belonging of the individuals. Even for profiling, he based himself only on mandibular characteristics for sex and for age on dental abrasion. These characteristics alone do not reliably define age and sex. Today, individual biological characters are sought on all bones of the individual and the observation of a multitude of characters is widely desired to arrive at an acceptable estimate of the individual character of human remains.

In 1976, B. Chavane had to carry out excavations at the Ogo site. At the level of the hole four that he carried out on this site, B. Chavane uncovered a double burial. He determined that it was an adult and a child. The child's skeleton was in the same burial pit as the adult, being placed immediately above the skeleton of the adult individual. The body of the child was oriented in the same direction as the adult individual, but the skull - lying on the right side - was turned in the opposite direction. According to B. Chavane, the relative position of the two skeletons indicates that the burials were simultaneous and suggests that they were a woman and a child, both of whom died at the same time, or perhaps one was responsible for accompanying the other to the grave. Anthropological measurements of the skulls could not be made because the skulls were destroyed by gold diggers who believed that gold was created inside the heads of the dead (Chavane, 1980). According to B. Chavane (1980), the dentition, which is complete and has a low degree of erosion, indicates that the adult individual died around the age of 20. The upper median incisors of the adult individual were voluntarily mutilated by ablation of the mesial angle. The presence of this dental mutilation, the position of the limbs and the orientation of the skeleton and the skull make it possible to establish that the individual was not Muslim (Chavane, 1980).

Reflecting broadly on the burials that he excavated and observed, B. Chavane concludes that the absence of furniture or the simplicity of the burial could be linked to the modest social status of the individuals (Chavane, 1980). This interpretation seems too simple to us; only on the basis of these elements we cannot be fully sure that this skeleton comes from the lower social classes. One of our investigations at Garly Doogal is associated with a cowrie shell and a bracelet on the hand that was excavated by Thiam and Thiaw. Again, the position of the individual and study the position of the body and head was assessed by the orientation of the cervical vertebrae. The position of the other elements of the skeleton can be gradually altered due to the action of the rodents.

In 1991, the resumption of excavations at the Sincu Bara site allowed S. MacIntosh and his team to excavate human remains in the middle Senegal River Valley. In one of their test pits, SB 2 ($9m^2$) and specifically in its feature 6, two adult human individuals were found at 1.5m depth. Unlike the human remains found in the Senegal River Valley, this collection has been subject to more detailed observations and descriptions. The profiling is carried out on several individual characters, especially the teeth. This is the beginning of a first application of observations that move away from identity-based interpretations and are oriented towards understanding the individuals' lifestyles, their health status, etc. These changes can be explained by the introduction in the region, starting from the 1990s, of the procedural approach set up by the American scientists.

The initiators of this new vision, the MacIntoshes, also set up the Middle Senegal Valley project. Within the framework of this project, two surveys were carried out by Aliou Deme (and the team that was already working in this project) in Walaldé (Deme, 2003; Deme & McIntosh, 2006). On this site, the team was able to gather an important osteological collection. The features of Survey 1, installed on this site, yielded human skeletons, at a rate of one skeleton per feature. As for Survey 2, carried out on the same site, it delivered a human skeleton in its Feature 4, located at a depth of 3.7 - 3.9m. Feature 3 of this hole revealed a human skull. The newly discovered remains have been the subject of important descriptions that go beyond the usual definition of genera. Some observations were made on dental forms and pathologies. The study of the ancient DNA of these individuals could greatly contribute to the understanding of their life paths and confirm the archaeological and chronological assumptions related to the Walalde site.

In 2017, as part of her Master's thesis, A. Thiam noted the presence of several skeletons outcropping on the surface in the Soubalo Mboum site. The survey that she set up on this site the same year, allowed the excavation of a human individual. Apart from a slight description of this burial, little is still known about this individual. The archaeology of the Senegal River Valley has focused more on the material evidence, while the populations responsible for the production of this material culture are not well studied. This region is known as a melting pot of civilizations where several communities have lived. But, bioarchaeologically, almost nothing is known about this people. However, since 2018, this region has experienced a renewal of research focused on the lifestyle, circumstances, and life paths of the historical communities of this region. Our thesis on one of the sites of this region, the Doogal, is oriented towards the reconstitution of the life paths by using archaeological, historical, bioarchaeological and dental resources.

Discussion

Senegalese bioarchaeology should focus on disciplines such as dental anthropology for several reasons: among the osteological assemblages, teeth are the most frequent human remains - this is due to the conservation capacity of the teeth -. Beyond the metric and non-metric dental features that their study can provide, teeth are basic tools for the identification of archaeological populations.

Also, ancient DNA and isotopic data can be extracted from teeth. The identities and the biological relations between groups and communities can be accurately established by studying the teeth. Therefore, it is certain that dental anthropology plays an extremely important role in understanding the historical and sociological evolution of Senegalese archaeological communities. Senegal River Valley is considered a melting pot of civilizations that have existed and disappeared.

Based on the archaeological material left by these communities, we can distinguish the chronological order of several cultures, starting with the beginning of the first millennium CE. But the question that can be asked is: is there really a biological difference between these populations? Dental anthropology, through the study of non-metric traits, could help to answer this question. This branch of science makes it possible to establish the biological distances between communities through the study of their dental morphology.

Teeth, the basic tools of dental anthropology, provide information on the biological relationships between human populations (Coppa et al., 1998; Eades, 2003; Irish, 2000; McIntosh & Scheinfeldt, 2012; Scott & Irish, 2013; Florez, 2015; Marado et al., 2017). Indeed, human tooth formation is controlled by a number of genes that act at various points and intervene at different times during tooth construction (Munaro, 2012).

This leads to genetic drift, which manifests itself in the dentition in the form of hereditary non-metric traits specific to each human individual (Eades, 2003; Desideri, 2003). Identification of these non-metric traits is achieved first by direct or naked-eye observation of the teeth. Subsequently, micro-tomographic observations and 3D geometric morphometry will enable better visibility of dental non-metric features. The description of dental features is based on the reference models Freiburg University Dental Trait System (FU-DTS) and Arizona State University Dental Anthropology System (ASUDAS).

Conclusion

At the end of this article, focused on a diagnosis of the evolution of bioarchaeology in Africa and Senegal, we note that the studies of human remains are relatively rare and are very often limited to the assessment of biological characteristics. However, funerary archaeology was initiated in West Africa at the beginning of the 20th century CE (Holl, 2012; Gokee & Thiaw, 2018). In its early stages it was conducted by non-professionals from the colonial administration (Thilmans et al., 1980; Holl, 2012 ; Gokee & Thiaw, 2018).

These colonial projects were bolstered by the establishment of IFAN, Institut Français de l'Afrique de l'Ouest, in 1936. This French institution hosted research programs focused towards the ethnicization and racialization of African populations (Gokée & Thiaw, 2018). After the independence of Senegal (1960), a second phase of archaeological research began, with new projects and more or less coherent objectives being initiated - this time by professional archaeologists and anthropologists.

This research, carried out by the I.F.A.N., which became the Institut Fondement d'Afrique Noir, made it possible to divide the Senegalese archaeological landscape into four archaeological provinces: the Senegal River Valley, the tumuli zone, the shell mounds zone and the megaliths region (Martin & Becker, 1984). Unlike the Senegal River Valley, the last three are designed on the basis of monuments and funerary rites (Thiaw, 2010). I. Thiaw (2010) acknowledges from the beginning that the archaeology of the valley was mainly focused on the reconstruction of human settlement and cultural identity. On the opposite, the lifepaths of the historical populations remain mostly unknown. The recent involvement of new technologies and branches of science (biological anthropology, ancient DNA, bioarchaeology, historical bioarchaeology and dental anthropology) will allow us to better understand the lives of the populations that occupied the valley (Larsen, 2002; Larsen, 2015; Agarwal, 2021). Our work on Doogal site, located in the Senegal River Valley, is based on historical, archaeological, bioarchaeological and dental data and aims to bring light on the life paths of the local archaeological communities.

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