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The lithic assemblage from Pont-de-Lavaud (Indre, France) and the role of the bipolar-on-anvil technique in the Lower and Early Middle Pleistocene technology

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ABSTRACT

The lithic assemblage of the Pont-de-Lavaud site (Indre, France) shows a technical choice within the Lower Pleistocene European Mode 1 sites, which is defined by the widespread use of the bipolar-on-anvil knapping technique. Although it is traditionally considered an expedient percussion method, in this lithic assemblage a selective technical behavior regarding the reduction methods and raw material is identified. In this respect, different knapping methods are applied in accordance with a combination of the percussion axis and the recurrence of the reduction series. These features are also observed in the archaeological record from other Lower and Middle Pleistocene sites, which are discussed in the text. The role of this knapping technique in the hominin technology is, in our opinion, greater than previously believed. Its implementation cannot be considered as proof of opportunistic or expedient activities. The bipolar-on-anvil technique is applied in different contexts, on different raw materials and as a technical choice or gesture in the reduction sequences. Because of its low technical requirements, it can be considered as a successful technological strategy for overcoming raw material constraints for producing some specific types of pieces. Its ubiquitous presence, both from a diachronic and geographical point of view, is proof of its considerable technical versatility and, hence, of Mode 1 hominin technological flexibility and capabilities.

1. Introduction

The archaeological site of Pont-de-Lavaud is one of the Lower Pleistocene sites located in the Middle Loire River Basin to the north of the Massif Central (France) (Despriée and Gageonnet, 2003; Despriée et al., 2006, 2010). Because of its location on the northern edge of the Massif Central it became one of the first sites providing evidence for human settlement beyond the 45°N latitude outside the circum-Mediterranean area (Despriée et al., 2006). The technological characteristics of the lithic assemblage fall within the European Mode 1 Techno-complex (Mosquera et al., 2013) but show some peculiar features defined by the almost exclusive use of quartz, and the use of bipolar-on-anvil as the main knapping technique (Despriée et al., 2010). Hence, the human occupations of the Pont-de-Lavaud site can be considered as an example of the technological and settlement flexibility of the European late Lower Pleistocene hominins.

This assemblage shows a technical specialization defined by a very high proportion of a specific knapping technique: bipolar-on-anvil reduction. The aim of this paper is to focus on this method in order to describe its use on a specific raw material, quartz. Its implementation could be explained either as an adaptive strategy to environmental and lithological constraints or as a cultural choice. Secondly, the predominance of the bipolar-on-anvil technique in this late Early Pleistocene site raises the question about its role within the hominin technological behavior of the Mode 1 and Mode 2 techno-complexes, which will be further discussed.

Several authors have approached this technique through experimental programs and ethnographic models in order to characterize the flaking products and their visibility in the archaeological record (Curtoni, 1996; Kobayashi, 1975; Hayden, 1980; Honea, 1965; Johnson, 1978; Prous and Lima, 1990; Shott, 1989, 1999).

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Even though increasing attention has recently been paid to this technique in the African and Asian context through experimental approaches (Díez-Martín et al., 2009, 2011; Mora and de la Torre, 2005; Gurtov and Eren, 2014; Zaidner, 2013; Sánchez Yustos et al., 2012), less attention was paid to it in the European record until the last decades (Callahan, 1987; Crovetto et al., 1994a; Donnart et al., 2009; Drift, 2012; Driscoll, 2011a; Mourre and Jarry, 2009–2010; de la Peña Alonso, 2011; Rankama, 2002; Vergès and Ollé, 2011). On the other hand, few works have dealt with the functionality and socio-economic context of this knapping technique in either prehistoric or actual human communities (Bradbury, 2010; Eren et al., 2013; Goodyear, 1993; Jeske, 1992; Knutsson, 1988; Kuijt and Russell, 1993; Lindgren, 2003; Shott, 1989, 1999).

It has traditionally been considered that the bipolar-on-anvil percussion was an expedient technology that was used as a complement to freehand percussion, and that it was directly linked to raw materials constraints (Bordes, 1947; Breuil, 1954). Nevertheless, as in the case treated here, this premise is not so straightforward and the bipolar-on-anvil technique is applied on different materials (i.e. Berman et al., 1999; Curtoni, 1996; de la Peña Alonso and Vega Toscano, 2013; Binford and Quimby, 1963; Peretto et al., 1998) and in different contexts. Traditionally, it has been considered to be a direct response to raw material constraints (Curtoni, 1996; Díez-Martín et al., 2011; Prous and Lima, 1990), but other factors must be taken into account such as a selective behavior (Barsky et al., 2011), socio-economic factors such as recycling or toolkit maintenance (Jeske, 1992; Goodyear, 1993; de la Peña Alonso and Vega Toscano, 2013) and even group mobility (Shott, 1989; Eren et al., 2013). It must therefore also be understood to be one of the earliest technological responses to functional or environmental constraints.

2. The bipolar-on-anvil technique

The bipolar-on-anvil technique is aimed at obtaining flakes through an elementary operational sequence, which consists of using a hammer to strike a core, which is positioned on a stationary anvil (Crabtree, 1972; Drift, 2012; Mourre, 2004; Shott, 1989; Prous and Lima, 1990). The similarity of this knapping technique, in terms of movements, requirements (both cognitive and in terms of grip and skill) and elements with the percussive activities and strength-based use of tools observed in some chimpanzees and capuchin monkeys for processing organic materials (especially nut cracking), place it as one of the earliest knapping techniques used by hominins (Ambrose, 2001; Bril et al., 2012; de Beaune, 2004; Panger et al., 2002; Sanz and Morgan, 2007; Visalberghi et al., 2007; Westergaard, 1995; Whiten et al., 2009: 431; Wynn and McGrew, 1989).

These ape activities are defined by selecting two objects (anvil and hammerstone, usually of mineral origin), transporting either both or only one of them (Boesch and Boesch, 1984; Visalberghi et al., 2007, 2009; Spagnoletti et al., 2011), and their interaction with another material, such as nuts, in order to achieve an immediate goal, obtaining the food resource. In some cases, some lithic by-products with suitable cutting edges can be inadvertently produced. These resemble artefacts from the earliest archaeological sites (Mercader et al., 2007; Panger et al., 2002; Westergaard, 1995). These technical and behavioral convergences may point to the origin of the hominin technology. Its similarity, as well as the presumed homogeneity of early hominin technology (Carbonell et al., 2009), may explain the difficulties, or even the impossibility, to identify any links between the apes pounding activities and the first stages of tool technology in the archaeological records (see Panger et al., 2002: 242). The recent discoveries from Lomekwi 3, dated to 3.3 Ma, seem to support this hypothesis (Harmand et al., 2015).

Its simplicity makes it an easy technique to learn and apply. Because of this, it is sometimes cited as a learning activity or, based on ethnographic evidence, as evidence for the division of lithic production tasks by gender (Hayden, 1980; Lindgren, 2003; Sillitoe and Hardy, 2003; Weedman, 2010). The bipolar-on-anvil technique has been shown to be suitable in various technological and economic contexts in which the main objectives are the production of lithic implements (Shott, 1989, 1999; Hayden, 1980; Prous and Lima, 1990); specific tools (Hayden, 1980; Jones, 1994); or microliths for making composite tools (Eren et al., 2013; de la Peña Alonso and Vega Toscano, 2013; Klaric, 2009; Prous and Lima, 1990).

Because of its specific flaking mechanics, this technique has some advantages in comparison with freehand percussion. The specific initiation and propagation model of the fracture force related to bipolar percussion (Cotterell and Kamminga, 1987) makes it easier to overcome some raw materiaĺs internal flaws, which is especially relevant to quartz based assemblages (Bordes, 1947; Breuil, 1954; Prous and Lima, 1990; Díez-Martín et al., 2009). This simplicity is, however, limited by the lack of knapping control, which makes it impossible to manufacture predetermined flaking products (Bordes, 1947; Hardaker, 1979; Shott, 1989; Patterson and Sollberger, 1976). Experimental approaches do, nevertheless, show that some foreseeable morphologies, edge angles and blank sizes can be obtained, which in some cases could reflect the knappers' main objectives (Díez-Martín et al., 2011; Mourre, 2004; Prous and Lima, 1990).

The absence of format limits on how the core is gripped for knapping, which is indeed defined by the width of the knapper's fingers, is one of these technique's main advantages over freehand percussion. It can be used to reduce small sized pebbles (Berman et al., 1999; Curtoni, 1996; Kuijt and Russell, 1993; Honea, 1965); profiting small flakes as cores for secondary knapping (Zaidner, 2013; Crovetto et al., 1994b); for recycling tools as cores, and for toolkit maintenance (Goodyear, 1993; Jeske, 1992; Amick, 2007; Hiscock, 2003; de la Peña Alonso and Vega Toscano, 2013). In some cases, the bipolar-on-anvil technique can be performed as a technical gesture within a more complex *chaine operatoire* in order to create new striking platforms in large pebbles or hard materials (Arzarello and Peretto, 2010; Bosinski and Guicharnaud, 2008), or to break large blocks into smaller fragments which may then be further reduced by freehand percussion (Bracco, 1993, 1998).

This expedient technology thus makes maximum use of the raw materials with only a small investment in terms of technological knowhow (Putt, 2015). This is especially evident in a socioeconomic context of low regional mobility and maximization of local lithic resources (Curtoni, 1996; Eren et al., 2013; Goodyear, 1993; Jeske, 1992; Shott, 1989). The versatility of bipolar-on-anvil percussion is defined by its multiple functional contexts, and technical and cognitive simplicity. These features explain its widespread use throughout space and time. Nevertheless, the identification of this technique in some assemblages may be overlooked in previous analysis due to the great difficulty in identifying artefacts produced using this method (Driscoll, 2011a; Johnson, 1978).

3. The Pont-de-Lavaud site

The Pont-de-Lavaud site is located at Eguzon-Chantôme (Indre) in the Massif Central sector of the Middle Creuse River Valley, at the southern boundary of the Centre Region (Indre, France). In this area, the Creuse river flows north-westwards through the