Chapter 8
Origin and Development of Pressure Blade Production in the Southern Iberian Peninsula (6th–3rd Millennia B.C.)

Antonio Morgado and Jacques Pelegrin

8.1 Introduction

Crabtree (1968), based on Spanish chronicles, demonstrated pressure blade production in Mesoamerica. Tixier (1976) was the first to report on this technique in Northern Africa; following his contribution, the presence of the pressure knapping technique blade production has been increasingly acknowledged across a variety of cultural periods. Inizan (1991, 2003) compiled the available data from a number of Eurasian archaeological sites, providing a general framework on the origin, development, and dissemination of pressure blade manufacture. Although the distribution of pressure blade production in the Iberian Peninsula is likely to be consistent with that of neighboring Western Mediterranean regions, no systematic study has addressed the subject in depth.

The present study aims to provide a general outline of pressure blade production in the Southern Iberian Peninsula. For the purposes of technique identification, we will occasionally refer to experimental knapping studies (Tixier 1976; Pelegrin 1988, 2002). The analysis will be based on the assemblages of knapped lithic artifacts from the Late Prehistoric sites investigated by the Prehistory Department of the University of Granada (Martínez 1997; Martínez and Morgado 2005; Morgado 2008; Morgado et al. 2008, 2009; Ramos Millán 1997). Special attention will be given to the site of Los Castillejos de Montefrío (Arribas and Molina 1979; Afonso et al. 1996; Cámara et al. 2005) and Toro cave (Martín Socas 2004a, b), due to its broad stratigraphic sequence (6th–3rd millennia B.C.) (Fig. 8.1).

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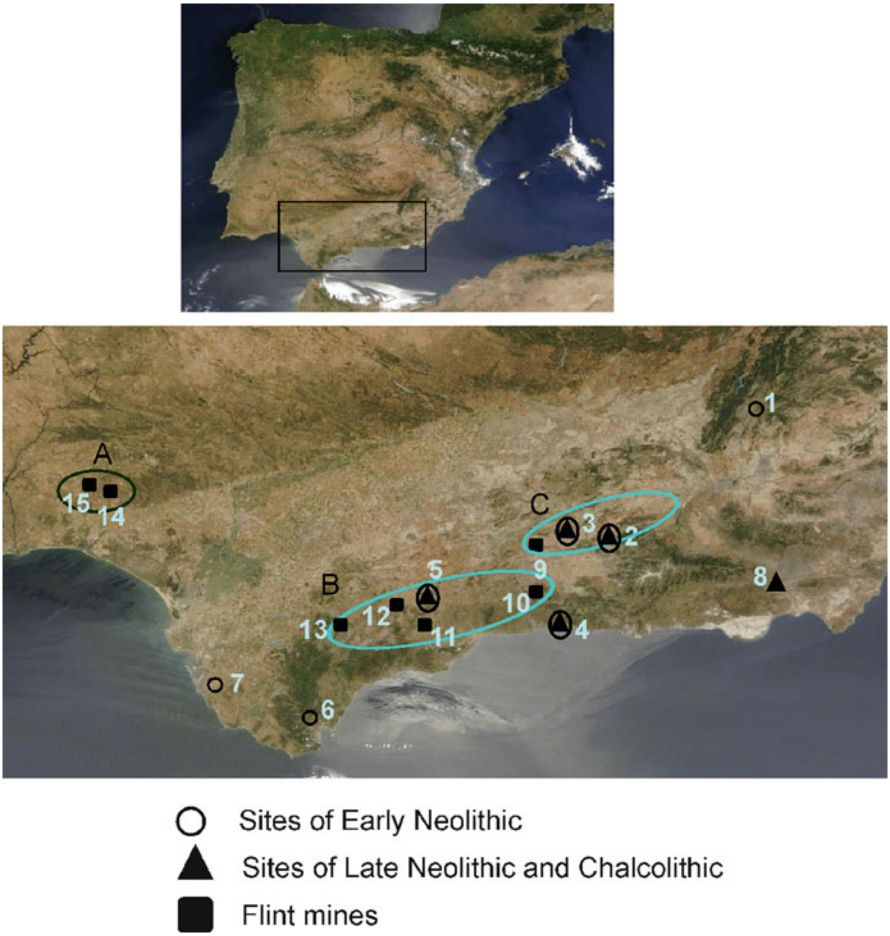

Fig. 8.1 Southern Iberian Peninsula, sites and flint mines. *1* Nacimiento cave; *2*: Carigüela cave; *3* Los Castillejos de Montefrío; *4* Nerja cave; *5* Toro cave; *6* Palmones; *7* Retamar; *8* Los Millares; *9* Los Gallumbares; *10* Cerro Alcolea; *11* Ardite/El Garrotal; *12* Valle del Turón; *13* Malaver; *14* Calañas; *15* Cerro de Andevalo

Pressure knapping blade production spread first among the Neolithic growers and shepherds of this region of the Mediterranean. The Neolithic in Southern Spain has been commonly regarded as an instance of a technical break due to the implementation of new productive systems absent from the last groups of hunter-gatherers (i.e., agriculture, cattle raising, pottery, and polished stone technology). However, among the lithic artifacts manufactured in this region, only knapped stone lithic assemblages have demonstrated typological differences (Fortea et al. 1987; Juan Cabanilles 1984). Moreover, the data supplied by a number of archaeological sites suggest that pressure blade production was widely disseminated in parallel to the systematic exploitation of abundant flint resources in the region.

Blade production experienced quite a unique evolution in the Southern Iberian Peninsula. This area of Western Europe developed a distinctive process of craft specialization for flint blade production beginning in the Late Neolithic. The technical features of blade production in Southern Spain became clearly distinguishable from elsewhere in the Western Mediterranean and seem technically closer to those of the Eastern Mediterranean and the Near East.

8.2 The Origin Issue and the Early Neolithic (ca. 5800–4000 B.C.)

Groups of farmers and cattle raisers of the Early Neolithic (ca. 6th millennium B.C.) were the first to make pressure knapping blade a common production, widespread technique in the Western Mediterranean (Binder 1984, 1987; Binder and Gassin 1988; Binder and Perlès 1990; Léa 2004; Pelegrin 2003; Terradas and Gibaja 2002). However, it should be noticed that some hunter-gatherers in Western Europe during the Upper Paleolithic were aware of the pressure flaking technique. Some groups used pressure to retouch tools, especially during the Solutrean period, and microblade production by pressure has been demonstrated in a few instances during the terminal Pleistocene (Alix et al. 1995). Some suggest that pressure knapping blade making may have emerged as a result of highly standardized bladelet production in Late Ice Age Western Europe. However, as posited by Pelegrin (2000), there were alternative technical procedures for blade production (e.g., direct percussion) used by late hunter-gatherers. The basic features of knapping by pressure technique use within flint material (i.e., detachment straightness, parallel arrises and edges, lightness; Tixier 1976) have been rarely reported in groups of the European Paleolithic (Alix et al. 1995). Pressure was unusual and limited to short periods and/or at a regional scale, thus holding a negligible role on the broad framework of blade and bladelet production.

Beginning in the Recent Mesolithic, regular pressure knapping bladelet production emerges in the last groups of hunter-gatherers in certain areas of the Western Mediterranean, the North African Upper Capsian (Inizan 1984; Tixier 1976), and some last groups of the European Mesolithic (Castelnoviense) (Binder 2000; Binder et al. this volume). These groups developed between the 7th and 6th millennia B.C. and coexisted short after with the Early Neolithic populations. Some of these groups developed bladelet standardization and geometric element manufacture (Inizan 1984). As a result of the arrival of typical Neolithic items and the neolithization of the Western Mediterranean, pressure blade production became a widespread technique.

Although a few sequences of hunter-gatherer groups of the Late Ice Age in Southern Spain have been reported, the evidence is still scarce. Although the available studies have described the basic typological characteristics of these assemblages, the analysis of the knapping production techniques has not been explored. The sequences from the Magdalenian and Epipaleolithic periods documented at the sites of Nerja Cave (Aura et al. 2009; Cava 1997; Jordá Pardo 1986), Nacimiento Cave (Asquerino and López 1981), Pirulejo site (Cortés 2008), and Palmones site

(Ramos Muñoz and Castañeda 2005) provide no evidence of the systematic use of pressure blade production. However, a few researchers have documented pressure knapping technique before the Neolithic expansion, for instance, at the site of Palmones River (Ramos Muñoz and Castañeda 2005), and the transitional period between the Epipaleolithic and Neolithic (Cava 1997; Ramos Muñoz and Lazarich 2002). However, both cases have been dated in times immediately preceding or concurrent with the earliest dates of the 6th millennium B.C. The situation changes dramatically when blade assemblages from Early Neolithic groups are analyzed. The first layers of the Early Neolithic are characterized by a high percentage of blades (60–80%), although in a few archaeological sites, a high percentage of geometric elements remain, suggesting continuity across Epipaleolithic groups (Asquerino and López 1981; Ramos Muñoz and Lazarich 2002). The percentage of geometric elements tends to decrease or disappear altogether over time. In regard to technology, the Neolithic brought about a more generalized pattern of heat treatment of flint together with pressure blade production. Blade production shows a low level of secondary modification: most of the time, bladelets have raw edges without retouch, a major typological feature of Neolithic blade assemblages. The systematic use of pressure after heat treatment lessens the need of secondary modifications. Pressure technique applied on heat-treated flint, together with knapping by pressure, thus became a distinctive feature of the Western Mediterranean Neolithic.

Although data are scarce, it can be assumed that the small production of microblades by means of handheld pressure does not demonstrate a widespread innovation by hunter-gatherer groups of the Late Pleistocene. As it has been suggested elsewhere, it is only at the beginning of the Neolithic that pressure knapping technique becomes part of the sociotechnological system of blade production, spreading across populations and with a variety of forms (blades and bladelets).

The technoeconomic and sociocultural context changed with the onset of the Neolithic in the 6th millennium B.C. The analysis of lithic production in the Early Neolithic Southern Spain has identified technical processes similar to those of other regions of the Western Mediterranean. Several studies describing the typology of these assemblages (Cava 1997; Ramos Muñoz 1988–89) have shown some geometric elements from the final hunter-gatherers (Ramos Muñoz and Lazarich 2002; Ramos Muñoz and Castañeda 2005; Aura et al. 2009). However, in purely Neolithic sites, geometric lithics are rare or absent (Cava 1997; Martín Socas et al. 2004a, b; Pellicer and Acosta 1997). On the other hand, from the very beginning of the Neolithic, there is a preeminence of bladelets and blades.

During the Middle Neolithic (5th millennium B.C.), geometric elements typical of preceding periods virtually disappeared along with backed blades and burins, while scrapers are rarely documented. On the other hand, a high percentage of bladelets with traces of use, both raw and retouched, have been found. Traces of use, notches, and denticulates are distinctive typological features of a variety of elements. There is also a strong development of blade technology along with an abundance of tools with high levels of secondary modification.

Early Neolithic strata from the sites of Cueva del Toro (ca. 5500–4600 B.C., Martín Socas et al. 2004a, b), Los Castillejos de Montefrío (ca. 5300–4800 B.C.,

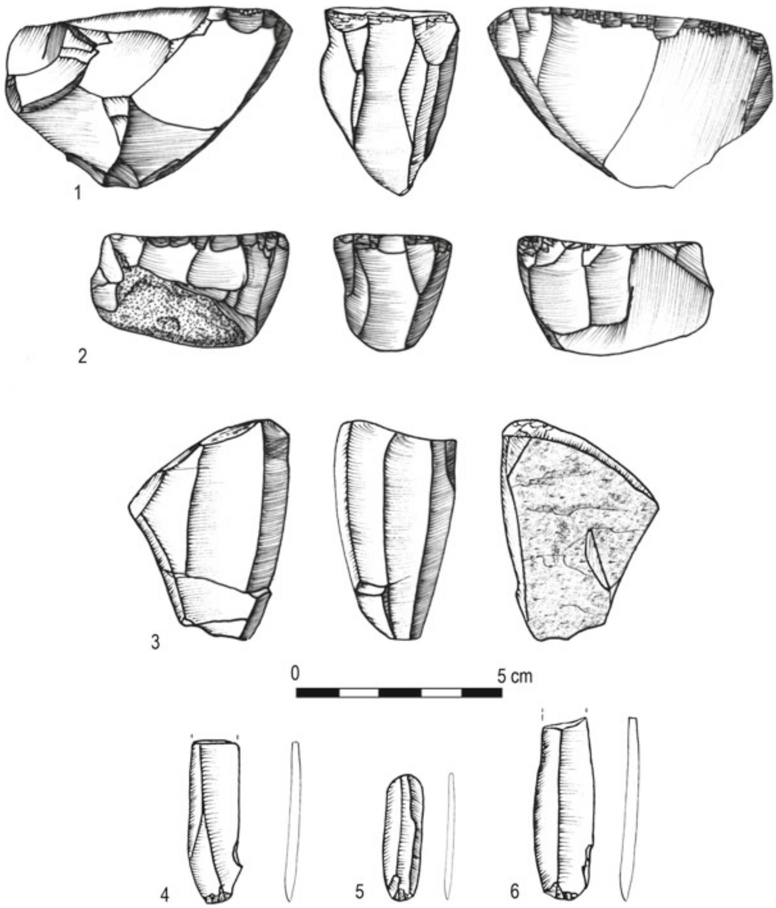

Fig. 8.2 Early Neolithic of Southern Iberian Peninsula. Pressure blades production. *1–2* Carinated performs, flint mine of Los Gallumbares; *3* Core, Los Castillejos site; *4–6* Blades and bladelets, Los Castillejos site

Cámara et al. 2005), and Carigüela Cave (Pellicer 1964) provide evidence of the use of pressure and preliminary heat treatment of the core for the production of bladelets (Inizan and Tixier 2001). Knapping by pressure technique applied on heat-treated material became a standard procedure from the Early Neolithic (ca. 5600/5500 cal. B.C.) until the 4th millennium B.C. The length of pressure-manufactured bladelets ranges from 20 to 40 mm, with almost no instances above 60 mm; less than 10% of bladelets are 13 mm or more in width. However, it should be noticed that for larger blades, indirect percussion without heat treatment was the customary practice. In summary, heat treatment was used in almost all pressure-manufactured blades, while very few had more than 13 mm in width. The domestic specialization of small blades may be a result of handheld pressure or pressure exerted with a short crutch in a sitting position (Fig. 8.2).

The preparation of the core prior to blade detachment requires carinated preforms with narrow striking platforms shaped by direct and indirect percussion (Fig. 8.2). Carinated preforms have been documented in a few flint deposits across the Betic Cordillera in Eastern Andalusia. These preforms are widely known in the Western Mediterranean and are also documented in domestic contexts indicating heat treatment (Binder 1987; Chauchat et al. 1996; Léa 2004).

Pressure blade production was persistent throughout the Early Neolithic. There are two major strategies for the preparation of the core prior to blade detachment: (a) abrasion and rubbing down of the overhang, following a movement directed toward the debitage surface, and (b) blades with a faceted butt and no edge abrasion. For the latter technique, the preparation of the pressure platform requires the detachment of minute flakes in order to place a point that will exert the pressure. We are still uncertain if these technical procedures for core preparation belong to distinguishable manufacture processes or geographical areas, or, on the other hand, are converging solutions for a single technical process. The site of Los Castillejos has one of the most abundant lithic assemblages of the advanced Early Neolithic, namely, over a thousand items and a collection of some 500 blades. Almost all blades at Los Castillejos follow a preparation of carinated cores with plain pressure platforms, while the proportion of blades with a faceted butt is low. This trend persists beginning in the 5th millennium B.C. until the Late Neolithic. During the early 4th millennium B.C., a technical change in blade production occurred. Average-size to large pressure-manufactured blades are characteristic of this period, while the domestic production of blades and bladelets of small size still remains with a variety of butt subtypes.

8.3 The Late Neolithic: The Technical Change (ca. 4000–3500/3400 B.C.)

Toward the first half of the 4th millennium B.C., a number of significant sociocultural changes took place. The construction of large villages in river valleys or inner lowlands and the appearance of collective burials are among several outstanding features of this period. The Late Neolithic has been divided into two phases: Early (ca. 4100–3800 B.C.) and Final Neolithic (ca. 3800–3400 B.C.) (Cámara et al. 2005; Molina and Cámara 2005; Pérez Bareas et al. 1999). The early phase displays continuity with the preceding period, but with a few significant changes, that will affect the next phase of village settlement consolidation.

These changes also parallel the lithic production of knapped stones. At the end of the period, geometric elements evolve to bifacial, knapped arrow points. As opposed to the Early Neolithic, these geometrics are larger due to their blade blanks. The increasing size of blades becomes obvious in the stratigraphic sequence of the region, as shown in natural caves occupied since the Early Neolithic

(Nerja, Carigüela, Toro, etc.) and in the new village settlements (Papa Uvas, Polideportivo de Martos, Llanete de Los Moros, etc.). The increasing size results from the increasing strength applied to the lithics. Additional features are the absence of heat treatment of flint and the trapezoidal sections of blades, resulting from the preparation of prismatic preforms and cores. Initially, these blades show a variety of butt subtypes (plain, plain faceted, convex) until butts with a sharp dihedron become the standard.

The stratigraphic sequence of the site of Los Castillejos de Montefrío may be a good example to illustrate the process. The site shows a technical change in pressure blade production during the third phase of Late Neolithic (Morgado et al. 2008). A number of enlarged blades with trapezoidal sections and sharp dihedral butts have been found from this period. These blades originated from prismatic cores and crests extending over the whole longitudinal length of the core. However, the new systems for blade extraction coexisted with the Neolithic systems of pressure bladelet manufacture from carinated cores and heat treatment.

The new system for blade production lasted until the Late Chalcolithic. This method required an extensive shaping of the core preforms by indirect percussion (Pelegrin and Morgado 2007; Morgado et al. 2009) (Fig. 8.3). There are two stages in the manufacture of preforms. In the first stage, the volume of the core and its crested edges are roughly shaped. In the second stage, the pressure platform and the crests, which will later guide the extraction of the first blades, are completed. There are abundant precores worked with three or four crests (two anterolateral and two posterolateral crests). A number of pieces (cores and crested blades) show that short and narrow transversal flakes were used to complete crests and eliminate imperfections. Several archaeological observations, compared to experimental stigmatas, suggest that a pointed punch that is made of some hard material was used for this purpose (Inizan et al. 1994; Méry et al. 2007; Pelegrin 1994, 2003; Pelegrin and Morgado 2007), most likely a punch armed with a point made of copper or a similar material (suggested by the small impact traces of about 2 mm in diameter). These marks resemble the blunt point of a pencil and are located in the hollow of a previous negative bulb. Thus, it might have been an enduring material harder than an antler point, which would quickly crack and split. Moreover, the flattened appearance of a few residual crests, crested blades, and neocrests also suggests that a pointy and enduring utensil was applied – a utensil that could be precisely located in the hollow of a negative bulb or over the crests.

Once the core preforms are completed, the crucial stage of blade detachment begins. The first extractions are obtained from the best delineated crests from the precore. Depending on the regularity of the first extractions, a steady pace of blade detachment will continue until the core's exhaustion. Given that a number of reshapings may occur during the process, the flint knapper may have to create new crests (i.e., neocrests) or use reserved ones (the posterior or lateroposterior crests of the core) to repair the core by a series of transversal flakes so that the blade extraction process can go on.

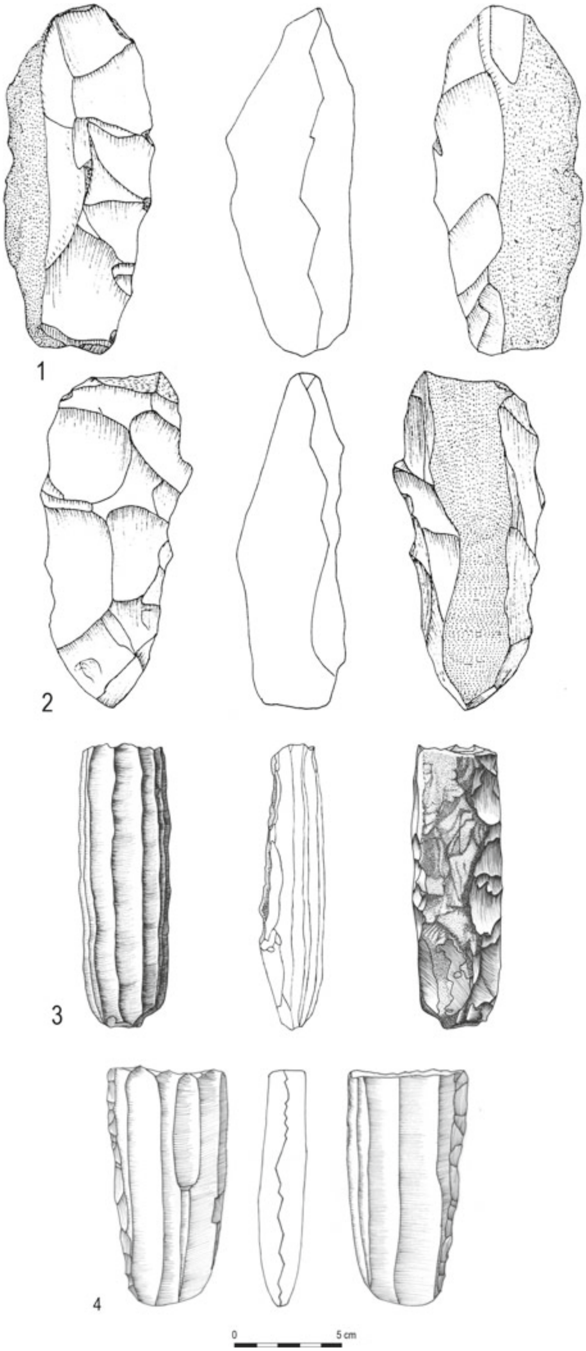

Fig. 8.3 Late Neolithic and Chalcolithic of Southern Iberian Peninsula. Pressure blade production. *1–2* Core performs, flint mine of Los Gallumbares; *3–4* Cores, flint mine of Los Gallumbares

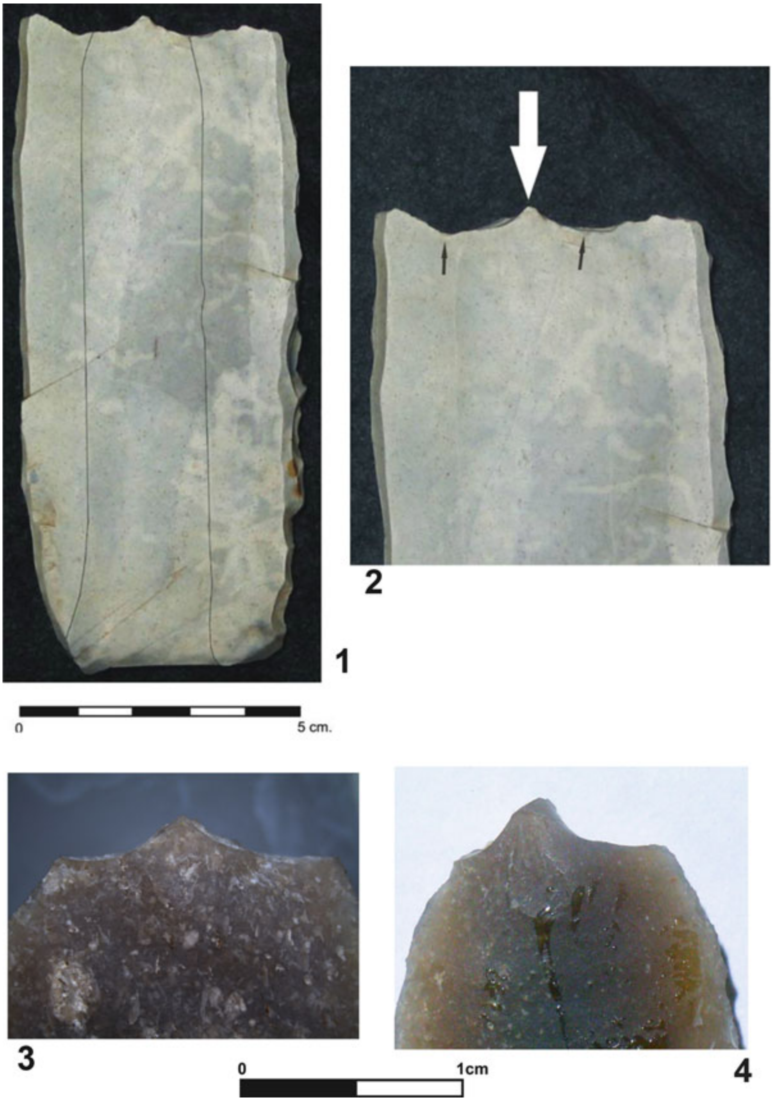

Fig. 8.4 Late Neolithic and Chalcolithic of Southern Iberian Peninsula. Pressure blade production. *1* Prismatic core, flint mine of Los Gallumbares; *2* The preparation of the pressure point; *3–4* Butts with a sharp dihedron

The blade's butt and the pressure platform of the core (observed during the last detachment) show that each blade has been extracted from a dihedron standing out of the core's edge (Fig. 8.4). This extraction procedure was highly standardized; therefore, most blade butts are consequently sharp dihedrons, while very few are asymmetric dihedrons, which may just be a version of the same design. A similar platform preparation has been already observed in Greece during the Late Neolithic (early 5th millennium B.C.), where it has been associated with copper-tipped pressure tools (Perlès 1984, 2004). A similar transition has been also demonstrated in Pakistan starting in the Chalcolithic period (late 5th millennium B.C.) (Inizan and Lechevallier 1990; Pelegrin 1994). Consistent with the cases of Greece and Pakistan, the butts extracted from sharp dihedrons found in Southern Spain also suggest a new knapping production element, namely, a metallic pressure point (copper) for blade detachment.

A number of hypotheses on the knapping production technique have been posed. Some of them propose the use of pressure, although they provided no insight on how the large blades were extracted. According to alternative hypotheses, indirect percussion may overcome the technical restrictions of pressure, allowing blades of nearly 40 cm in length in exceptional cases to be obtained.

The characteristics of these blades and their knapping traces strongly suggest the use of pressure technique. Moreover, the increased length and width of these products requires the exertion of higher strength and a higher control of the metallic point. As we have seen before, butts with a sharp dihedron entail the accurate location of the point where the pressure tool will be applied. On the other hand, as a number of experiments have shown, lever pressure systems could solve the issue of the increased need of pressure strength (Pelegrin 1988, 2002, 2003: 62–63; 2006; Pelegrin and Morgado 2007). Lever pressure overcomes the limitations of simple pressure (i.e., in a standing position), allowing the manufacture of larger blades (over 20 cm in length and 20 mm in width). In fact, various experimental studies have established a roof of 22–23 mm in width for flint blades detachment by means of pressure with a copper point (Pelegrin, this volume). Blades of smaller widths could have been extracted by standing pressure transmitted by a pectoral or abdominal crutch, while larger blades may have been manufactured applying pressure with a lever.

8.4 The Chalcolithic: The Skilled Production (ca. 3400–2400/2300 B.C.)

The Chalcolithic led to new forms of settlements and burials in the south of the Iberian Peninsula. Big fortified villages surrounded by stoned walls with strongholds attached emerged at this time. A similar phenomenon can be traced in Portugal (Zambujal, Lecia, Vila Nova de Sao Pedro, etc.) and the Western Mediterranean. A few instances of these settlements in Southern Spain are Los Millares in the Southeast, Marroquíes and Los Alcores de Porcuna in the Guadalquivir River Valley, and Valencina de la Concepción at the lower end of the Guadalquivir River. These sites emerge at the end of the 4th millennium B.C. For some of them the downfall comes at the end of the next millennium during the Late Copper and Early Bronze periods.

For instance, according to the absolute dating of Los Millares (Molina et al. 2004), its earliest foundation goes back to the Early Chalcolithic (ca. 3300 B.C.) expanding practically over all of the 3rd millennium B.C. until it was abandoned in the Late Copper period (ca. 2300/2200 B.C.).

The emergence of big villages during the Late Neolithic resulted in increasing territorial partitioning and social stratification during the Chalcolithic. The specialization of flint knapping artisans is coincident with the growing complexity of the society and the territorial structure. Flint knapping involved skilled production in different regions during the Chalcolithic. This process is manifest in Southern Spain, where the major necropolises of the period show knapped artifacts of high technical quality. These elements are of two main types: (a) large blades and (b) bifacial elements including arrow points and, more rarely, knives and "halberds" (very large and wide), all of them made of special materials (flint, jasper, rock crystal, etc.).

The production of large blades prevailed in this period, although a residual industry of bladelets remained during the Early Chalcolithic (end of the 4th millennium B.C.). These bladelets have sharp dihedral or convex-faceted butts, while cores have consistently a prismatic or conic-pyramidal morphology producing bladelets of less than 20 mm in length. The core is worked around a half or more of its perimeter. This production is typical of the Early Neolithic, but here they are manufactured with the new methods of crested preforms and pressure point preparation using sharp dihedrons. On the other hand, the preparation of the carinated cores with plain pressure platforms disappears during the 4th millennium B.C., suggesting that the old method was replaced.

Bladelet production is nevertheless residual, as there is a wide dominance of blades extracted with a standing crutch or lever from prismatic cores shaped with three or four crests. Craft specialization consolidates in three regions: the mountains of Eastern Andalusia in the areas of the Western and Central Subbético Mountain Range and the subvolcanic siliceous rocks of Huelva in Western Andalusia (Fig. 8.1). The specialization process for the blade production was consistent throughout Southern Spain.

As the evidence from several necropolis shows, blade sizes vary from 110 to 150 mm in length and 18 to 20 mm in width with outstanding cases reaching 400 mm in length and 40 mm in width (Fig. 8.5).

As mentioned before, the experimental tests conducted by Pelegrin strongly suggest that flint blades of 22–23 mm width or more required lever pressure to be manufactured. Lever pressure seems to be the main technique for large blade production in Southern Iberia during the Chalcolithic.

These large blades have been found far away from their manufacturing areas, in both domestic contexts and megalithic burials, suggesting that they were, to some extent, the subject of traffic and exchange. Their presence has been documented within the grave goods of the main megalithic necropolis (i.e., Los Millares, Valencina de la Concepción, Marroquíes). In these burials, the blades were left without retouch or with simple edge retouch, being fractured most of the time.

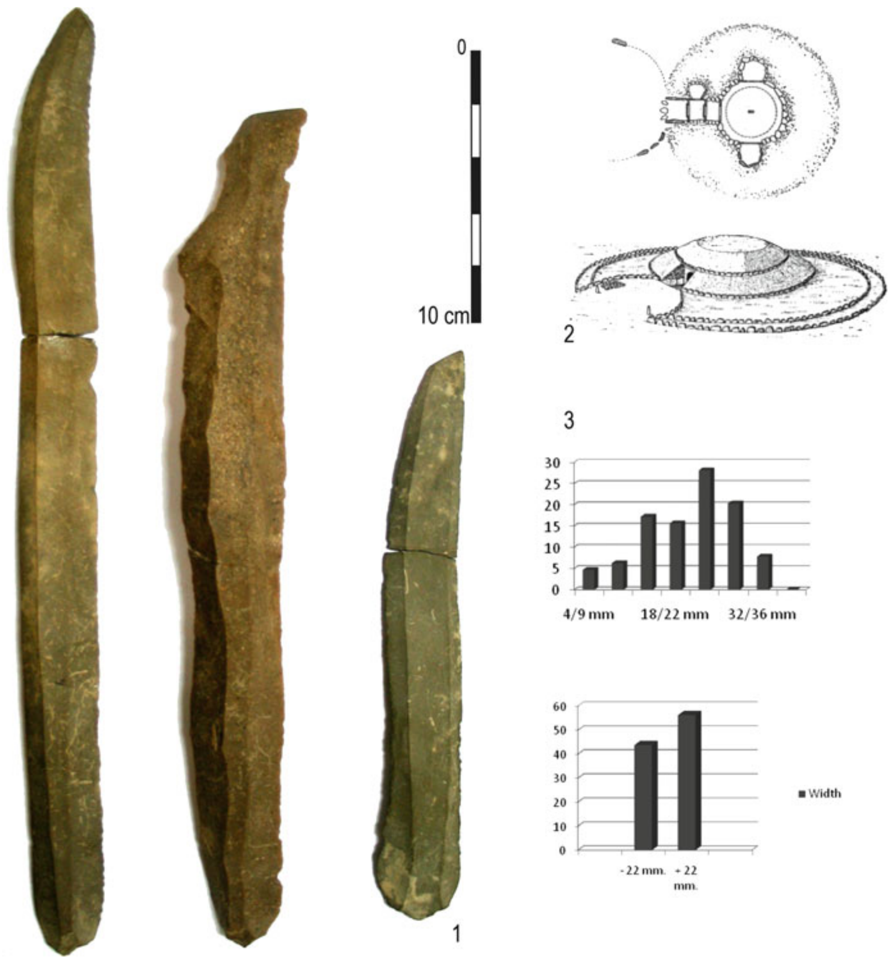

Fig. 8.5 The production of large blades, Chalcolithic of Southern Iberian Peninsula. *1* Long blades, Los Millares necropolis; *2* Tomb type tholos (reconstitution), Los Millares necropolis; *3* Statistical variability of the blades width, Los Millares necropolis

Although studies of the raw materials have just started, the technical features of the blades from Southern Spain (lever pressure, but with a sharp dihedron) are different from those of other regions such as Central Portugal (indirect percussion, thick-facetted butts) (Morgado et al. 2009; Pelegrin 2006) and the Ebro Valley (pressure technique knapping, butts without a sharp dihedron, also indirect percussion), clearly distinguishing these industries and establishing blade traffic routes. The presence of these blades in distant regions of the peninsula (from the Southeast to the West in Portugal and Galicia) is a clear sign of their circulation through long distances (Nocete et al. 2005; Morgado et al. 2011).

The second half of the 3rd millennium B.C. brought deep cultural changes. Incise Bell-Beaker pottery became a standard and was later followed by the rising of a new cultural period: the Bronze Age. These changes included new forms of settlements, changes in the burial rituals, and an expansion of metallurgy. Flint knapping specialization vanished, and consequently, pressure as a knapping technique for blade production also disappeared during the Late Chalcolithic. As the demand for large blades died down, so did the knapping production techniques related to blade specialization. From this moment, flint knapping was restricted to domestic settings for the purposes of local manufacture of some tools (primarily saw-toothed sickle elements extracted by simple direct stone percussion).

8.5 Conclusion

In the present state of our knowledge, the knapping pressure blade production appears for the first time, with the Neolithic in the south of the Iberian Peninsula, during the 6th millennium B.C. This technique of blade production was associated with heat treatment of flint. The preparation of the core prior to blade detachment required carinated preforms. These preforms have been documented in the flint outcrops of the Betic Cordillera in Eastern Andalusia and the Neolithic sites. They are also widely known in the Western Mediterranean (Southern France) and are also documented in domestic contexts indicating heat treatment, although the dates for the knapping pressure technique and the heat treatment are more recent. This production was maintained during the 5th millennium B.C. with little changes.

On the other hand, the Late Neolithic (early 4th millennium B.C.) is a period of deep social and technological change. There is evidence of a distinctive shift toward the use of pressure knapping in blade production in Southern Spain during this period. While Early Neolithic production systems are common across the Mediterranean (i.e., handheld pressure, mini crutch used in a sitting position), the Late Neolithic brings a new production system specific to Southern Spain. Here, blade production becomes based on preforms made from prismatic cores shaped with three or four antero- and posterolateral crests. In addition, the butt morphology is quite unique: butts with a sharp dihedron allowing pressure concentration over an acute arris. The experiments conducted by Pelegrin demonstrate pressure knapping blade production by means of a copper pressure point. Finally, lever pressure became a novel blade extraction method starting in the Late Neolithic and remained common throughout the Copper Age until the second half of the 3rd millennium B.C. The Late Copper Age is the end of the process of the development of pressure blade production in the Southern Iberian Peninsula (Fig. 8.6).

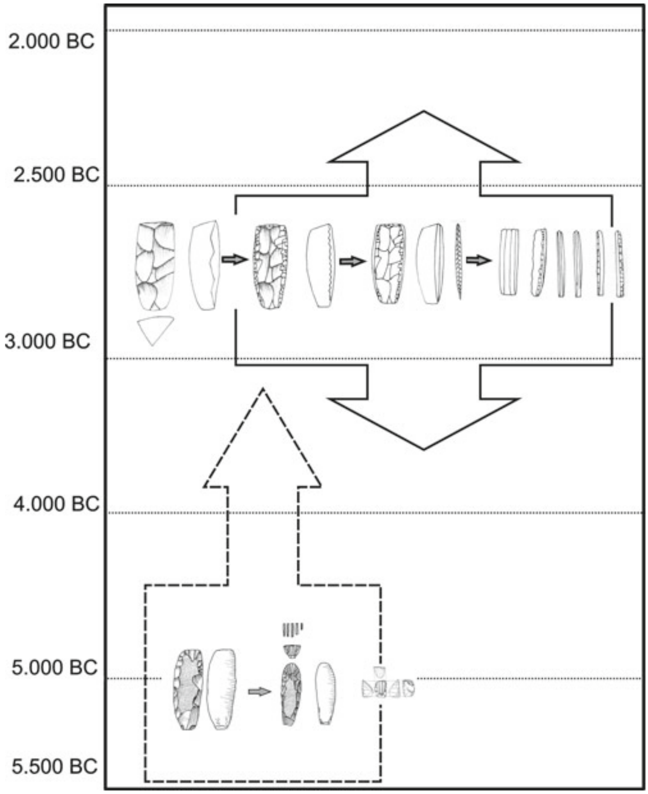

Fig. 8.6 Schematic evolution of pressure blade production, Southern Iberian Peninsula

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