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# ODONTOMETRY OF A SPANISH NEOLITHIC-BRONZE AGE SAMPLE.
## COMPARISON WITH OTHER POPULATIONS OF THE IBERIAN PENINSULA. II: DECIDUAL TEETH

**Virginia Galera**

*Departamento de Biología Animal (Antropología).*
*Facultad de Ciencias. Universidad de Alcalá de Henares.*
*28871 - Alcalá de Henares (Madrid, Spain).*

**RESUMO.** Analisam-se as dimensões da coroa dentária duma amostra de 80 dentes deciduais pertencentes a uma população infantil que foi enterrada na «Galeria del Silex», da gruta de Atapuerca (Burgos, Espanha), durante o Neolítico-Bronze Final. Através deste estudo estabelecem-se os padrões dentários deste grupo humano. Além disto, a comparação desta amostra com outras séries da Península Ibérica, permite prever, para a maioria dos dentes, uma estabilidade dos diâmetros dentários desde o Mesolítico até ao final da Idade do Bronze.

**Palavras chave:** Odontometria, dentes deciduais, Neolítico - Idade do Bronze, Espanha, comparações populacionais.

**SUMMARY.** Dental crown dimensions are evaluated in a sample of 80 decidual teeth belonging to a Neolithic-Bronze Ages infant population from Galería del Sílex (Atapuerca Cave, Burgos, Spain). The comparison of this sample with other Iberian Peninsula series is also realized and allows us to deduce the stability of dental diameters from Mesolithic to the Bronze Age for the majority of the teeth.

**Key words:** Odontometry, decidual teeth, Neolithic-Bronze Ages, Spain, population comparisons.

## INTRODUCTION

Atapuerca Cave is located twelve kilometers north-east of Burgos, on the Spanish Central Plateau (Fig. 1). This Cave is formed by several galleries, one of which is «Cueva Mayor», with a Middle Pleistocene chronology (Aguirre and Lumley, 1977; Bermúdez de Castro, 1986), and another is «Galería del Sílex» pertaining to the Neolithic-Bronze Ages (Apellániz and Uribarri, 1976; Domingo, 1986) and where the human remains of twenty five individuals, mostly infants, children and youths, with a Mediterranean typology (Galera, 1987, 1988), were found.


Fig. 1. Geographical location of the analized Iberian Península samples.

The lack of knowledge on decidual dentition in Prehistoric Spanish populations was the fundamental cause for the present research. So, the study of sample teeth belonging to these human remains is the basis for achieving our principal objectives which are to ascertain the metric crown diameter pattern for the Galería del Sílex population and try to present a model for the evolution of decidual teeth in the Iberian Península.

## MATERIAL AND METHODS

The material for this study is composed of eighty decidual teeth from Galería del Sílex, some of them appearing in the maxillaris and others as isolated pieces.

The mesiodistal (ØMD) and vestibulolingual (ØVL) diameters were measured (to the nearest 0.1 mm.), at crown level, using the Lefèvre, Verdéne and Flechier technique (Lefèvre, 1973; Olivier and Demoulin, 1984). For this purpose, a special caliper with wide, flat and thin tips was used (Bermúdez de Castro, 1986). Several statistical parameters (Sokal and Rolhf, 1981) were established for both diameters. Therefore, crown index, dental module and surface value (Hillson, 1986) were calculated for each type of tooth.

Afterwards, the Galería del Sílex sample was compared with the only other two populations in the Iberian Peninsula whose decidual teeth have already been studied at the present time. These populations are (Fig. 1): Muge, a small series from the Portuguese Mesolithic (Smith, 1978) and Gorafe, another small sample from Granada (Spain) with Eneolithic chronology (Souich, 1974). We also compared our population, with the only decidual tooth, a lower canine, from the Middle Pleistocene of the Atapuerca Cave (Bermúdez de Castro, 1986). The methods used for population comparison were graphic representation and, when possible, the Student «t» test (Sokal and Rolhf, 1981) was calculated. Finally, both diameters were correlated using equal frequency ellipses (Defrise-Gusenhoven, 1955, 1961; Leguebe, 1986) for our population and the other three; since the Galería del Sílex sample was small, the equal ellipses calculated by Menard (1977) for the Merovingian population, were used.

## RESULTS AND DISCUSSION

The morphometrical study of the Galería del Sílex decidual teeth sample (Table 1) allows us to observe that this population has the largest mesiodistal and vestibulolingual diameters for second molars, followed in size by first molars, canines and incisors. This size-model coincides with results which have been obtained by others investigating several European, Indian, Israeli and American populations (Sciulli, 1977; Smith, 1978; Frayer, 1978; Lukacs et al., 1983; Hillson, 1986). These findings are confirmed by the dental module and the surface value (Fig. 2) that permit us to evaluate the «general size» of each dental piece. Both indices also indicate that all the mandibular teeth (with the exception of the second molars) are smaller than their homologous upper pieces.

Table 1. Statistical parameters of decidual teeth

| TEETH | ØMD | | | ØVL | | |
|---|---|---|---|---|---|---|
| | n | $\bar{x}$ | s.d. | n | $\bar{x}$ | s.d. |
| $i^1$ | 4 | 6.63 | 0.43 | 6 | 5.25 | 0.38 |
| $i^2$ | 1 | 5.00 | --- | 1 | 4.60 | --- |
| $c'$ | 4 | 7.15 | 0.26 | 4 | 6.10 | 0.29 |
| $m^1$ | 11 | 7.15 | 0.76 | 14 | 8.39 | 0.48 |
| $m^2$ | 11 | 8.75 | 0.52 | 11 | 9.78 | 0.57 |
| $i_1$ | 1 | 4.00 | --- | 1 | 3.80 | --- |
| $i_2$ | 7 | 4.77 | 0.31 | 7 | 4.47 | 0.26 |
| $c_1$ | 6 | 6.08 | 0.41 | 6 | 5.56 | 0.34 |
| $m_1$ | 13 | 7.82 | 0.57 | 12 | 7.00 | 0.32 |
| $m_2$ | 17 | 9.99 | 0.31 | 15 | 8.79 | 0.23 |

ØMD

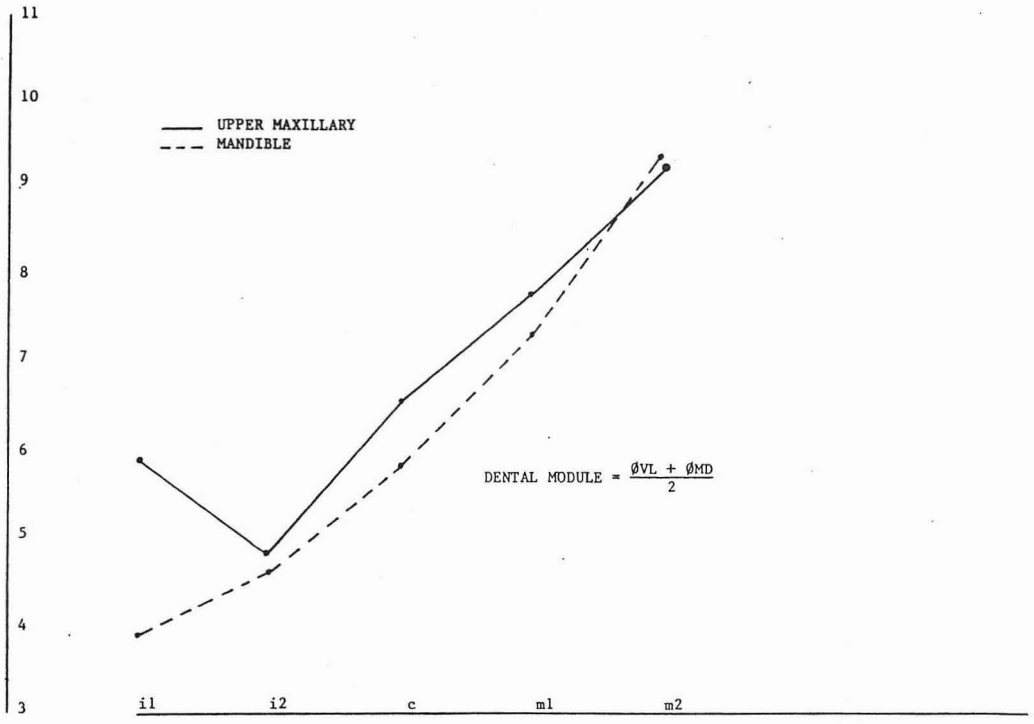
Upper maxillary: $m^2 > m^1 = c' > i^1 > i^2$

Mandible: $m_2 > m_1 > c_1 > i_2 > i_1$

ØVL

Upper maxillary: $m^2 > m^1 > c' > i^1 > i^2$

Mandible: $m_2 > m_1 > c_1 > i_2 > i_1$



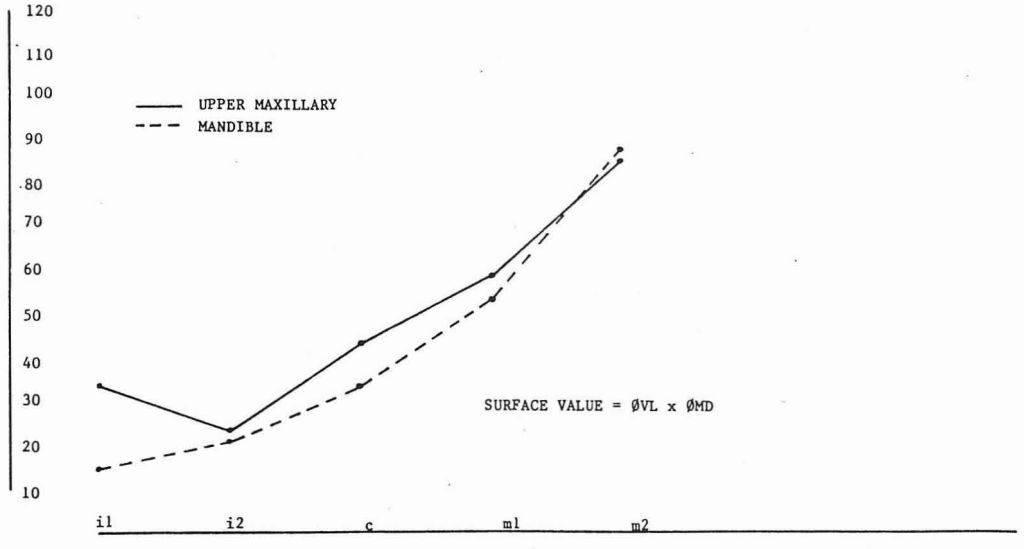




Fig. 2. Dental module and surface value of «Galería del Sílex» sample.

Dental shape was evaluated by the crown index (Fig. 3) observing that the mesiodistal diameter is greater than the vestibulolingual one in all types of teeth with the only exception of upper molars, that have more quadrangular crowns.

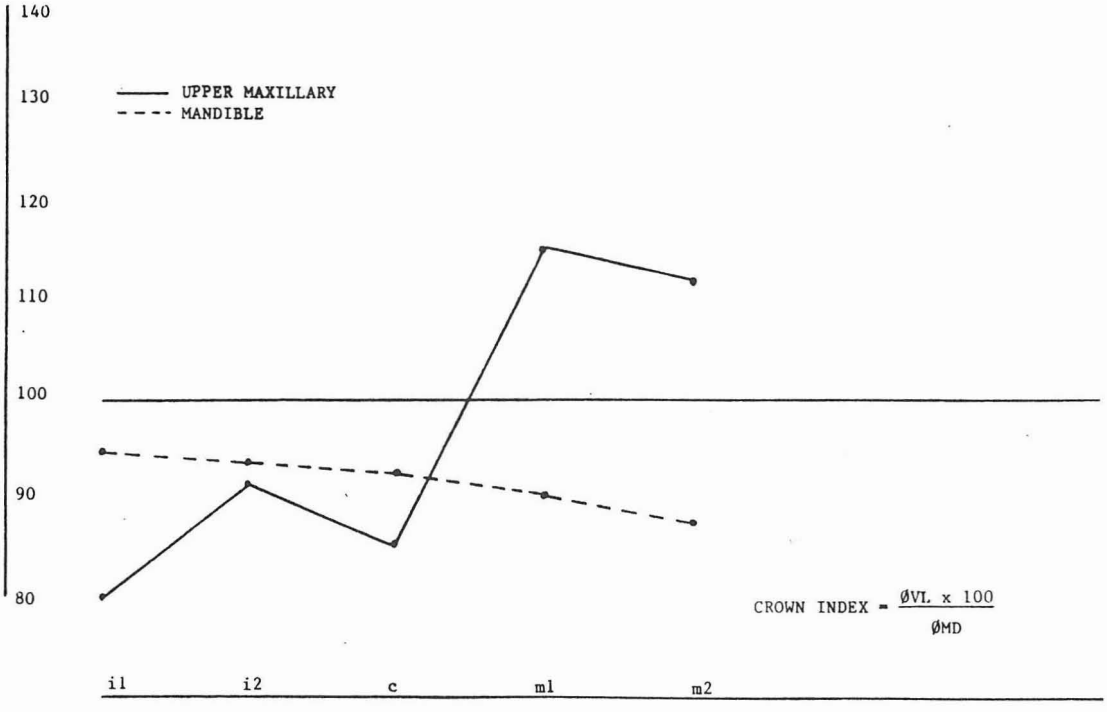



Fig. 3. Crown index of «Galería del Sílex» sample.

Population graphic comparisons (Fig. 4) indicate that Muge has the largest mesiodistal and vestibulolingual diameters for all dental pieces with the unique exception of vestibulolingual diameter of the first upper molar which is slightly larger in Gorafe population. We can also observe that the mandible canine with greatest diameters comes from Atapuerca's Middle Pleistocene deposits. On the other hand, smaller diameters refer to late samples, so Gorafe has the smallest anterior dentition (with the exception: ØMD of $i_1$) as well as $m^1$ and $m_2$ mesiodistal diameters while the smallest vestibulolingual diameters of posterior teeth and mesiodistal diameters of $m^2$ and $m_1$ relate to Galería del Sílex.

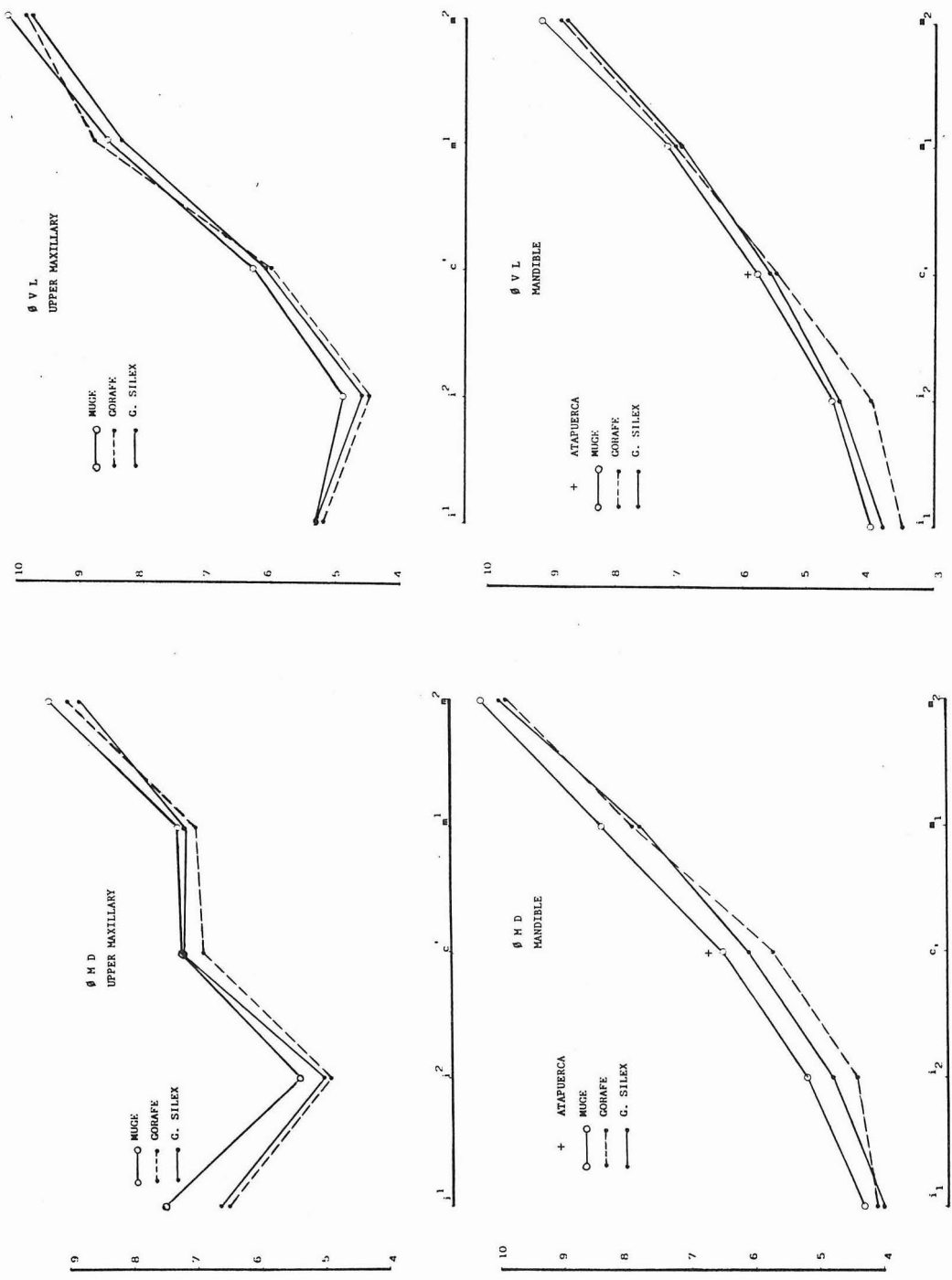



Fig. 4. Population graphic comparison

In order to see whether there is statistical differences between these populations, the Student «t» test (Table 2 and 3) was used, but only with Muge and Atapuerca values since the neccesary statistical parameters for Gorafe were not available. Significant differences (Table 2) were found between Muge and Galería del Sílex for the mesiodistal diameter of upper second molars and the vestibulolingual diameter of upper lateral incisors and lower second molars. There are no significant differences for both diameters in the rest of the teeth (Table 2) and in comparing the Atapuerca Middle Pleistocene canine with those from Muge and Galería del Sílex (Table 3). These results could indicate a high rate of stability in the decidual dentition size of the Iberian Península populations from the Mesolithic to the Final Bronze Ages, data which agrees with the research of other authors (Sciulli, 1977; Frayer, 1978; Smith, 1978; Lukacs et al., 1983). This decidual tooth size stability does not coincide with results obtained for the permanent teeth where a general decrease for both diameters from the Mesolithic to the Middle Age have been demonstrated (Galera, 1989).

Table 2. Statistical comparison of Muge and G. Sílex by Student «t» test.
* = 0.01 significance level
(.) = Basis series: G. Sílex
(+) = Basis series: Muge

| TEETH | | ØMD | | | ØVL | | |
|---|---|---|---|---|---|---|---|
| | | t | G.L. | P% | t | G.L. | P% |
| $i^1$ | (.) | -1.80 | 3 | < 20 | -0.29 | 5 | < 80 |
| $i^2$ | (+) | +0.57 | 1 | < 70 | +0.96 | 40 | < 1* |
| $c'$ | (.) | -0.18 | 3 | < 90 | -0.80 | 3 | < 50 |
| $m^1$ | (.) | -0.75 | 10 | < 50 | -0.90 | 13 | < 40 |
| $m^2$ | (.) | -3.18 | 10 | < 1* | -1.95 | 10 | < 10 |
| $i_1$ | (+) | +0.56 | 3 | > 60 | +1.61 | 3 | > 20 |
| $i_2$ | (.) | -2.24 | 6 | > 5 | -0.77 | 6 | < 50 |
| $c_1$ | (.) | -1.36 | 5 | < 20 | -0.80 | 5 | < 50 |
| $m_1$ | (.) | -2.23 | 12 | < 5 | -1.43 | 11 | < 20 |
| $m_2$ | (.) | -1.58 | 16 | > 10 | -3.50 | 14 | < 1* |

Table 3. Lower canine statistical comparison with the Student «t» test.

| | MUGE-ATAPUERCA | | | G. SILEX-ATAPUERCA | | |
|---|---|---|---|---|---|---|
| | t | G.L. | P% | t | G.L. | P% |
| ØMD | -0.38 | 7 | 70 | -1.40 | 5 | 20 |
| ØVL | -0.28 | 7 | 80 | -0.76 | 5 | 50 |

In equal frequency ellipses (Fig. 5) no significant differences have been observed between the analized Iberian populations, the greater differences being for Atapuerca and Muge. So, while Gorafe and Galería del Sílex are inside the first ellipse for all teeth, Muge appear inside the second ellipse for the first upper incisor and the lower canine and inside the third ellipse in the lower second incisor. Atapuerca is in the second ellipse for the lower canine. This stability in decidual tooth size was also demostrated by Menard (1980, 1981) who conclued that «the diameters of all temporary teeth from Upper Paleolithic to actuality have not been modified».

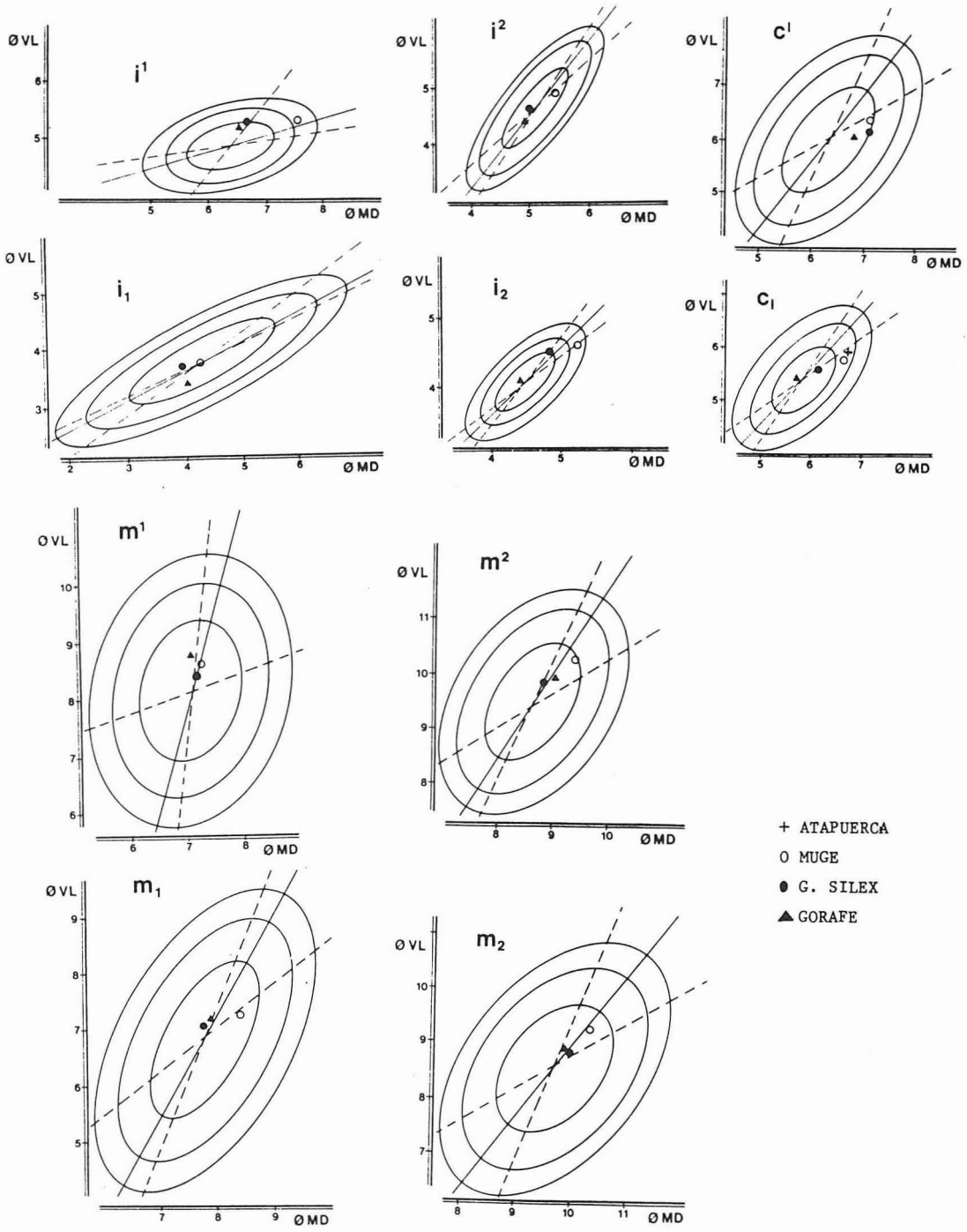



Fig. 5. Equal frequency ellipses for decidual teeth of «Galería del Sílex».

## CONCLUSIONS

The morphometrical study of the Galería del Sílex decidual sample allows us to estimate the size and shape of the teeth belonging to this Spanish population and observe that it has the same size-model as other Iberian, European, Indian, Israeli and American series.

Population comparisons show a decrease over time of mesiodistal and vestibulolingual diameters in the Iberian Peninsula from the Mesolithic to the Bronze Ages, but this decrease was only statistically significant in a few cases, since a stability of tooth size could be inferred during this period of time and the small decrease-diameter could be interpreted as adaptative responses to changing selective factors throughout time. Also the stability of both lower canine diameters from the Middle Pleistocene to the Final Bronze Ages have been observed.

In any case we should not forget the small amount of studies which have been done on this topic at the present time and we must wait for future investigations to confirm our findings.

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