Ann Anat **189** (2007) 304—308

Available online at www.sciencedirect.com

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Annals of ANATOMY

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Ritually induced growth disturbances and deformities of the orofacial system – A contribution to cranial morphogenesis

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Received 27 October 2006; accepted 9 November 2006

KEYWORDS
Cranial morphogenesis;
Growth disorders;
Exogenous influences;
Deformities;
Orofacial system;
Ritual acts

Summary

Numerous ritual acts involving the skull result in orofacial changes. The present study focuses on ritual acts of Brazilian Zoé Indians. A distinct deformation effect of the ritual act (wearing a lip-plug) on the morphology of the orofacial system is demonstrated and documented using jaw models. The studies show that the lip-plug significantly influences tooth position and jaw growth. While the maxilla displays palatal displacement of the lateral incisors and elevation of the palate, retraction occurs in the mandible depending upon plug size. Additionally, both the plug and the nutritional habits of the Indians induce marked abrasion of all teeth. Moreover, it is shown that the duration of lip-plug wear is an essential determinant of sustained orofacial changes.

Introduction

Cranial growth and morphogenesis are subject to numerous factors that may be attributed to endogenous and exogenous influences, repectively (Fanghänel and Timm, 1976; Fanghänel and Schumacher, 1986). Thus, the timing as well as the type, intensity and duration of these exogenous impacts play an important role for the occurrence of morphologic changes (Knussmann, 1996; Henke and Rothe, 1999). Mechanical influences, for instance those resulting from ritual acts, are of special importance. Such ritual acts in form and content have been established for many

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doi:10.1016/j.aanat.2006.11.009

generations and in most cases reflect a religious background.

The present study addresses the effects on the orofacial system of ritual acts of the Brazialian Zoe Indians. A special type of body modification is practised by this tribe. Indians of both sexes wear a wooden plug of up to 15 cm in length and 4 cm in width piercing the bottom lip (Fig. 1). It is carved from the wood of the Botoru tree and is quite hard and heavy. This ritual act leads to distinct morphologic changes of the orofacial system primarily affecting dental development and morphogenesis.

The present study aims to investigate which growth changes and pathologies of the orofacial system arise from such ritual mechanical irritations, in particular, how palatal morphology, tooth growth and position are influenced by lip-plug wear of the Brazilian Zoé Indians. Dental plaster casts available from an expedition to the Zoé Indians were utilized for this purpose (Garve, 2002; Winkelmann, 2006). A plaster cast of the mandible displaying jaw deformation and plug impression is shown in Fig. 2.

Materials and methods

Plaster casts of the upper and lower jaws and silicone casts of the palates of 11 Brazilian Zoe Indians were produced for this study. Furthermore, ritually inserted lip-plugs were preserved. The plaster casts were made of brown super hard dental stone (octa-stone, Heareus Kulzer® company). The moulds and casts were obtained by

Figure 1. Indians of different ages with wooden plugs *in situ*.

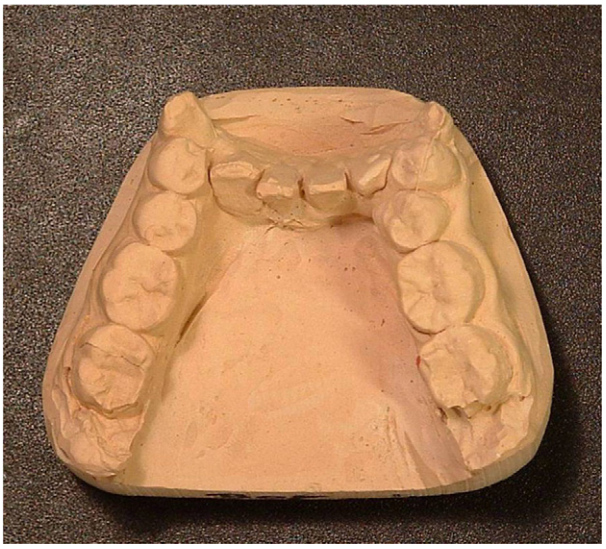

Figure 2. Plaster model of the mandible of an adult Zoe Indian with anterior semi-circular impression induced by the wooden plug.

R. Garve, DDS (Lueneburg) during several expeditions to the Zoé Indians. The models came from men and women aged 14–52 years, who were divided into an adolescent group (14–17 years) and an adult group (17–52 years).

First, the available models were examined for the following general parameters: dental state, abrasions and facets, recessions and bone situation. Besides overbite and overjet, sagittal, vertical and transversal deviations of the jaws were considered as part of orthodontic model findings. Since cusp landmarks were difficult to identify due to abrasion (Knussmann, 1988; Schmuth, 1990), the common orthodontic measuring lines were modified.

The following definitions were used for metric measurement:

Sagittal analysis: Maxillary length: Length of a perpendicular from the mid-incisal edge of the most posterior central incisor to the connecting line between the central fossae of the second molars.

Mandibular length: Length of a perpendicular from the mid-incisal edge of the most posterior central incisor to the connecting line between the central fossae of the second molars.

Transversal analysis: Anterior maxillary width: Length of the line between the mid-central fissures of the antagonist first bicuspids.

Posterior maxillary width: Length of the line between the mid-central fissures of the second molars.

Anterior mandibular width: Length of the line between the mid-central fissures of the antagonist first bicuspids.