THE ERUPTION OF THE FIRST PERMANENT INCISOR IN CATTLE

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Introduction

The development of the occlusion is achieved by the axial eruption of the incisors and premolars, supplemented by the more complex eruptive movements of the permanent molar teeth. These movements are easily appreciated from an examination of serial radiographs, but radiographs cannot adequately describe an activity that is taking place in three dimensions, and it is certain that details of the more complex movements are being overlooked. FRIEL (1954) described the disto-lingual rotation of the lateral incisors at birth, but gave no indication of the frequency with which this occurred, nor any idea as to how the teeth became correctly aligned.

It is the intention of this paper to emphasis the existence of unusual paths of eruption as a regular feature in some species, and thereby redirect attention to the importance of eruptive mechanisms in establishing normal occlusion.

This is a comparative cross-sectional study of the eruption of the first permanent incisor tooth of cattle which was carried out as part of a larger project to determine the chronology of tooth development in cattle (BROWN, CHRISTOFFERSON, MASSLER and WEISS, 1960).

Methods and Materials

Altogether 869 animals were x-rayed, and of these approximately 300 were between six months and two years of age, the age range for the development, growth and eruption of the first permanent incisor. The technique for obtaining the radiographs was developed by CHRISTOFFERSON and WEISS (1958).

Findings

The first permanent incisor begins to develop within its follicle close to the apex of the first deciduous incisor, and the crown is formed six months later. Among all the radiographs examined at the appropriate developmental age, the crown was found to develop in a plane at right angles to its final alignment in the mouth. The lingual surface of the tooth was directed towards the mid-line *(Fig. 1).*

Intra-osseous eruption of the tooth begins at eighteen months when a third of the root has been formed, and as eruption takes place the incisor begins to rotate within the bone. As eruption proceeds rotation of the tooth continues around its long axis and *Fig. 2* demonstrates the amount of rotation that may take place before the tooth emerges into the oral cavity.

When the tooth emerges into the oral cavity it is still partially

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rotated but then it comes under the influence of the oral musculature and correct alignment soon follows *(Fig. 3)*.

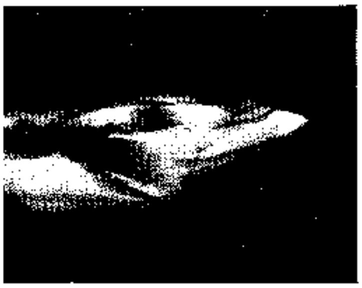

Fig. 1

A lateral X-ray view through one half of the mandible of a one year old animal. The first permanent incisor crown is fully formed lying with its lingual surface facing the mid-line.

Fig. 2

X-ray of a 20 month old animal. The first permanent incisors have rotated nearly 90°, and will shortly enter into the oral cavity.

FiK. 3 A two year old animal with the first permanent incisors correctly aligned.

DISCUSSION

As well as the sagittal rotations of human molars other complex movements of eruption have been reported. O'BRIEN, BHASKAR and BRODIE (1958) described the tilted developmental position of the first molar in *ia* rats which became corrected during eruption. SCOTT (1960) noted the rotation of the carnassial tooth of dogs prior to eruption. The exact mechanism for the rotation of the teeth is unknown, though no doubt the dental follicle and the developing periodontal membrane play an important role. Once the teeth have erupted into the oral cavity the muscle forces clearly assist in their final alignment, but it is difficult to explain how these forces can act on the teeth while they are still within bone as is suggested by HOVELL (1956), who states that the dento-alveolar structures should be regarded as being entirely moulded by soft tissue action and morphology. TULLEY (1957) threw further doubt upon this latter contention when he found from an examination of serial radiographs of a group of children from three years and five months to seventeen years that definite changes in incisor inclination took place only at six years and after.

The different phases of eruption are dependent therefore upon several factors, some that are known and others that may be guessed at. Because some species have very specific eruption paths, it seems that these different routes are as much part of their inherent constitution as are skeletal development, muscle behaviour or tissue morphology. It is suggested that future assessments of the aetiology of malocclusion should take these facts into consideration.

SOMMAIRE

PRaCESSUS D'ERUPTION DE LA PREMIERE INCISIVE PERMANENTE CHEZ LE RETAIL

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Une analyse de 1'intérieur de la bouche, opérée aux rayons-x, sur 869 bestiaux de toutes ages, a montre que la premiere incisive per-manente effectuait une rotation de 90 degres au cours de son eruption. On a suggéré que les processus d'éruption pourraient constituer un caractere héréditaire.

DISCUSSION

DR. SCOTT. I should like to ask MR. BROWN one question: Why does he find it necessary after the tooth has erupted into the mouth cavity to bring in muscle action at all? It seems that whatever produces the rotating process commences before the tooth enters the oral cavity and that this process is quite adequate in itself to explain the continuation of the rotation. Why when it enters the oral cavity should it have to slip into what I call the "soft tissue morphology" bog.

Mr. BROWN'S REPLY: Dr. SCOTT'S first remark is as pertinent as ever and only perhaps by removing the animal's muscles while he is still alive and allowing his teeth to erupt on their own could we ever completely know the extent which muscles do play in alignment of the teeth.

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