PATHOLOGY of TUMOURS of the ORAL TISSUES

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by

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With 109 Illustrations

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PREFACE

THIS account of tumours of the oral tissues has been written from the point of view of the diagnostic pathologist whose principal interest lies in the histological evaluation of biopsy and operation material. Naturally, the full assessment of the patient and his disability depends on the integration of all the available information, and of this morbid anatomy and histology represents only one fraction, though frequently a decisive one. The inclusion of remarks on the clinical and radiological features of the various lesions dealt with here is not, however, an attempt to provide a full description of all aspects that have to be taken into account in arriving at a diagnosis. These remarks are, rather, intended only to give the pathologist who may not be especially familiar with lesions in the oral region some idea of the general aspect and behaviour of these lesions, and a comprehension of what is likely to be in the clinician's mind when he sends material to the laboratory. Detailed accounts of these aspects of the subject are available in a number of excellent texts, for those who require fuller information.

Again for the benefit of those who may not have any specialised knowledge of the oral tissues, a short account of the normal histology and development of these tissues has been included. This feature likewise is not intended to replace the full descriptions provided in the special works on the subject. It is intended for those whose interests are primarily in pathological interpretation and who require only a sufficient background of embryology and histology, which for this purpose they may find it convenient to have at hand.

With regard to the principal subject matter, a wide view has been taken, for the pathologist will be interested not only in neoplasms but also in those non-neoplastic lesions that require to be considered in the differential histological diagnosis of tumours, in those that present clinically in such a manner that the clinician may regard them as possible neoplasms pending pathological examination, or in those that, though as yet non-neoplastic, may constitute possible premalignant conditions. For these reasons, a number of lesions that are not neoplastic have been included.

I have much pleasure in acknowledging the help I have received from many sources. My colleagues of the Royal Dental Hospital have generously placed at my disposal their clinical records, and have also furnished me with data and material from their cases elsewhere. In this regard I would wish particularly to thank the following for material from which the indicated figures have been prepared and for radiographs and clinical data: Mr. H. P. Cook (Figs. 19c, d; 64); Mr. B. W. Fickling (Figs. 15b; 16e; 51c, d); Mr. J. H. Hovell (Figs. 16d; 50) and Dr. D. Greer Walker (Figs. 16c; 28). Colleagues from other hospitals have been no less generous, and I should like to thank Mr. K. G. Boobyer and Dr. H. Miller for clinical data, radiographs and sections (Fig. 58); Dr. N. C. Gowing for clinical data and sections (Figs. 24c, d; 62c, d); Mr. G. T. Hankey, Professor A. E. W. Miles and Dr. J. P. Waterhouse for clinical data, radiographs and sections (Fig. 27); Professor A. B. MacGregor for clinical data, radiographs and sections (Fig. 52); Professor H. A. Magnus and Dr. B. C. Cardell for sections (Figs. 24a, b; 84); Mr. R. W. Raven and Mr. J. N. W. McCagie for clinical data and radiographs (Fig. 69); Mr. M. Tempest for specimens and clinical data (Figs. 65a, b; 73; 101c, d; 102b, c, d); Dr. A. C. Thackray for sections (Figs. 40; 63; 75d, e; 86) and Mr. P. A. Toller for specimens and sections (Figs. 16a, b; 38a; 49; 109a).

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My thanks are due to the following authors, editors and publishers for permission to reproduce their copyright material: Mr. H. P. Cook and the editor of *Oral Surgery, Oral Medicine, Oral Pathology* (Fig. 64a); Professor W. J. Hamilton and Messrs. Heffer (Figs. 1, 2, 4); Mr. Rainsford Mowlem, Mr. G. L. Fordyce and the editor of the *Proceedings of the Royal Society of Medicine* (Fig. 54d); and to the editors of the following journals for permission to reproduce figures from my own publications: *Journal of Clinical Pathology* (Fig. 109b); *Journal of the Royal College of Surgeons of Edinburgh* (Figs. 104c, d); *Oral Surgery, Oral Medicine, Oral Pathology* (Fig. 25a); *Proceedings of the Royal Society of Medicine* (Fig. 30a, with B. W. Fickling; Fig. 61a, with H. J. J. Blackwood). I am also indebted to Dr. S. Blackman and Messrs. John Wright and Sons Ltd for permission to reproduce from *An Atlas of Dental and Oral Radiology* the radiographs in Figs. 52, 53, 57, 72, 107 and 108.

I am particularly glad to acknowledge my indebtedness to Professor Ivor R. H. Kramer, who read the manuscript, made many useful suggestions and gave me the benefit of his wide experience. The views expressed, however, are not necessarily his.

Finally, I wish to express my thanks to my laboratory staff for their unfailing help and assistance. In particular, Mr. John Mercer, F.I.M.L.T., spent much time and effort on the preparation of the photomicrographs. Miss J. Middleton, Medical Artist to the Hospital, made the line illustrations (Figs. 3, 33, 34, 89). The great burden of secretarial work was cheerfully carried by my secretary Mrs. Brenda Coode. Miss Gillian Bayliss prepared the index.

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EMBRYOLOGY AND HISTOLOGY OF THE ORAL TISSUES

CHAPTER I

EMBRYOLOGY AND HISTOLOGY OF THE ORAL TISSUES

DEVELOPMENT OF THE ORAL CAVITY AND FACE

The Oral Cavity. The stomatodaeum is present in the 3-week embryo as a shallow cavity in the head region, with the brain above it and the pericardial sac below (Fig. 1). Dorsally the stomatodaeum is separated from the pharynx by the buccopharyngeal membrane, though this structure soon disintegrates to establish the continuity of the cavity with the foregut. At the back of the cavity, where it is bounded by the buccopharyngeal membrane, there is a cranial prolongation of the stomatodaeum, Rathke's pouch, from which the anterior part of the pituitary gland develops.

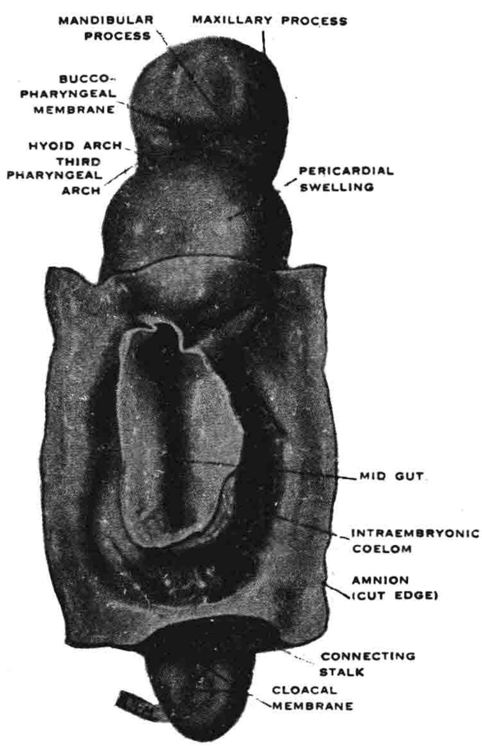


FIG. 1. The ventral aspect of a reconstruction of a 20-somite human embryo of about 26 days. Modified from Davis. × c. 32. (From Hamilton, Boyd and Mossman's "Human Embryology," Heffer, Cambridge.)

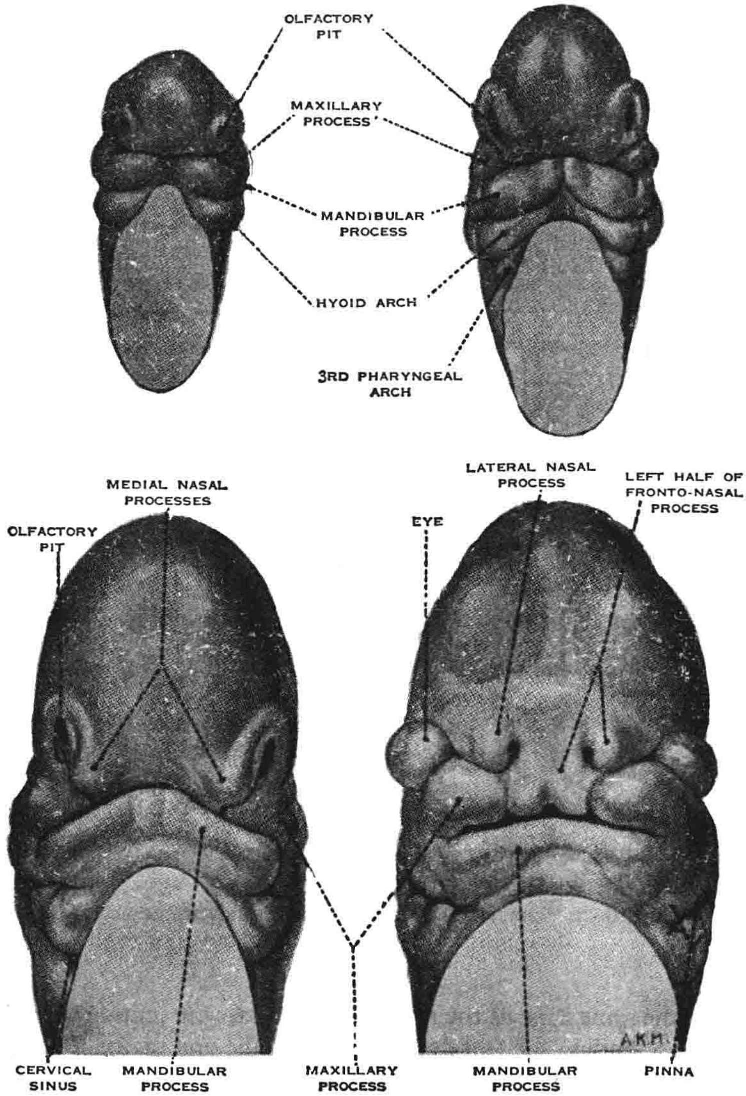


FIG. 2. Drawings of the ventral aspect of the head region of human embryos to show the development of the face. A—5·7 mm.; B—6·7 mm.; C—11·8 mm.; D—14 mm. (based on Streeter). (From Hamilton, Boyd and Mossman's "Human Embryology," Heffer, Cambridge.)

The Facial Processes. The mandibular processes arise at the sides of the primitive mouth cavity (Fig. 2). Each process grows forward to meet its fellow from the opposite side in the mid-line, thus forming the mandibular or first branchial arch. This arch constitutes the lower border of the oral cavity and separates it from the heart. Above the oral cavity the appearance of two depressions, the olfactory pits, divides the face into a central and two lateral areas. The central area forms the frontonasal process and the lateral areas are the lateral nasal processes. The portions of the frontonasal process in the region of the nasal pits constitute the medial nasal processes, and the inferolateral portion of each medial nasal process forms the globular process.

The maxillary processes develop as outgrowths from the dorsal part of the mandibular processes on each side and grow forward, beneath the developing eye, to form part of the upper boundary of the opening of the oral cavity. When each maxillary process reaches the region of the nasal pit it comes into close relationship with the other processes. At first the various processes are demarcated from each other by grooves, but by the seventh week the grooves have been obliterated by fusion of the processes, due to proliferation of the mesoderm and disintegration of the covering ectoderm in the area of union (Fig. 3).

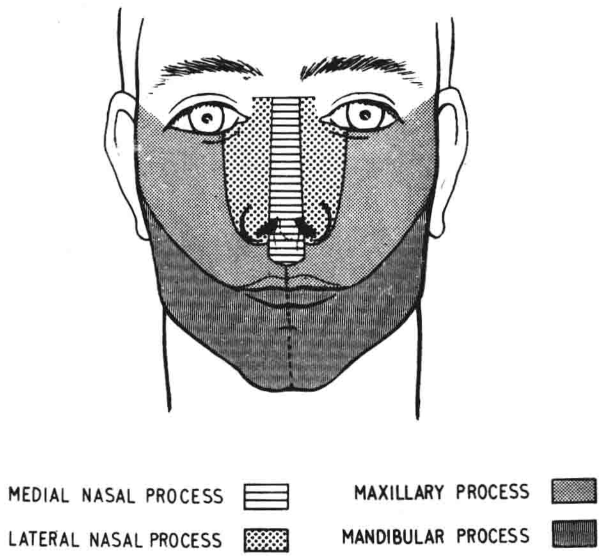


FIG. 3. Diagram of the adult face to show the areas derived from the various embryonic processes.

The Palate. At the same time as the maxillary processes are uniting with the other processes of the face they are also sending shelf-like extensions into the oral cavity. These extensions are the palatal processes, which eventually meet in the midline to form the posterior portion of the palate. The anterior portion is formed by similar shelf-like processes that extend backwards from the frontonasal process to fuse with each other and with the extensions from the maxillary processes. This fusion is incomplete, so that there remains a small gap in the midline, the incisive foramen. Another process also arises from the maxillary process where it forms the lateral wall of the oral cavity. This is the tectoseptal process, which grows towards the roof of the mouth to unite in the mid-line with its fellow from the opposite side, thus separating the brain capsule from the oral cavity. The united processes then turn downwards to form the posterior part of the nasal septum. The anterior part of the septum is formed by an extension from the frontonasal process. When the downward growing nasal septum reaches the level of the palate, the palatal processes have not yet reached the mid-line. This follows, and the palatal processes and the lower border of the nasal septum then unite. The primitive oro-nasal cavity is now divided into right and left nasal cavities on each side of the septum above the palate, and the oral cavity below the palate (Figs. 4 and 5).

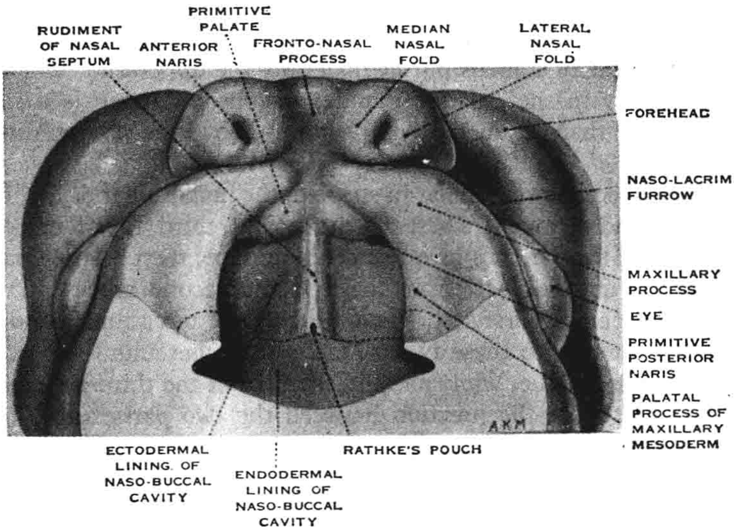


FIG. 4. A drawing of the roof of the stomatodaeum of a 13·5 mm. human embryo. A distinct palatal process from the maxillary mesoderm is now present. This will later meet its fellow of the opposite side and fuse with it and with the down-growing nasal septum. The latter is now seen as a ridge in the roof of the primitive nasal cavity portion of the stomatodaeum. The previous site of attachment of the buccopharyngeal membrane is shown by the interrupted line. (From Hamilton, Boyd and Mossman's "Human Embryology," Heffer, Cambridge.)

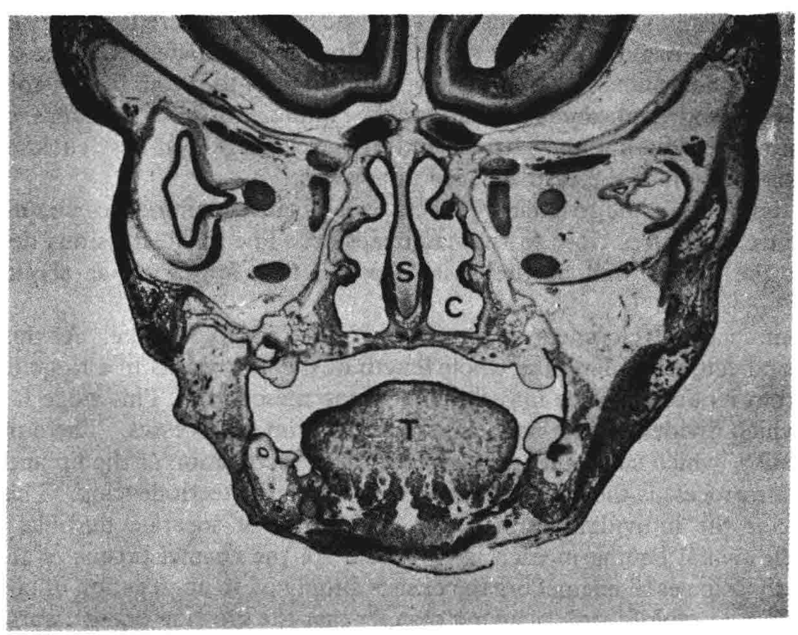


FIG. 5. Frontal section through the head of an approximately 12-week embryo. The palatine processes and nasal septum have united. × 4.

S Nasal septum P Palate C Nasal cavity T Tongue

The nasopalatine duct, traversing the incisive foramen, provides a communication between the oral and nasal cavities in many animals but in man only the upper end remains patent, the lower end terminating blindly in the palatine papilla. Jacobson's organ is a small detached portion of the olfactory plate that lies in the nasal septum above the nasopalatine duct. It is vestigeal in man.

The Tongue. A series of eminences similar in shape to the mandibular or first branchial arch develop parallel to the arch and below it. These are the second, third, fourth and fifth branchial arches. The first, second and third arches give rise to the tongue, the posterior part developing from the third arch and the anterior part from the first and second arches. Two eminences develop within the oral cavity on the first arch, one on each side, and a third eminence develops in the mid-line, somewhat dorsally to these two. This is the tuberculum impar. These three swellings form the body of the tongue, while an outgrowth from the third arch forms the base. The base grows to meet the body, the junction between the two parts being marked by the sulcus terminalis, which persists throughout life. The thyroid gland develops from a downgrowth of epithelium from the floor of the mouth, at the same time as the tongue is developing. The point of origin of this downgrowth, which becomes the thyroglossal duct, is marked on the dorsum of the tongue by the foramen caecum, situated between the anterior and posterior parts.

The epithelium of the tongue is at first of simple cuboidal type. From this there develop first the vallate and later the fungiform and filiform papillae.

For full accounts of the development of the oral tissues see Keith (1948), Hamilton, Boyd and Mossman (1962) and Sicher (1962).

DEVELOPMENT OF THE JAWS AND TEETH

The mandible develops in the mandibular arch, Meckel's cartilage appearing before ossification occurs. This cartilaginous rod extends from the otic capsule, where it gives rise to the incus and malleus, through the mandibular arch to the midline to meet its fellow of the opposite side. At the sixth week of embryonic life a thin plate of bone appears in the arch, immediately ventral to Meckel's cartilage, and ossification then proceeds rapidly. Most of Meckel's cartilage disappears, but near the middle line the extreme end of the cartilage is at first enclosed in a bony tunnel. Later, this portion of the cartilage also disappears.

The maxilla develops in the maxillary process. Ossification commences about the seventh week, from a centre or centres close to the nasal capsule. The maxillary sinus develops as an outgrowth from the lateral wall of the nasal capsule, first appearing at about the fourth month.

The teeth commence development in the sixth week of embryonic life. At this stage, proliferation of the oral ectoderm along the whole length of the jaw results in a ridge of epithelium growing down from its deep surface into the underlying mesoderm. This ridge is the primary epithelial band which divides, a little later, into outer and inner processes. The outer process is the vestibular lamina, which subsequently takes part in the separation of the lip and cheek from the jaw. The inner process is the dental lamina, from which the teeth develop. The first sign of the development of the individual teeth is the appearance of separate bud-like swellings at intervals along the dental lamina in each jaw. These are the enamel organs of the deciduous teeth. At this early stage each enamel organ consists simply of an aggregation of epithelial cells, but the cells proliferate rapidly and in such a manner that the growing organ assumes a cap-like shape. At the same time the mesoderm immediately adjacent to the developing enamel organ proliferates, forming a condensation termed the dental papilla. This structure will later give rise to dentine formation and will itself ultimately become the pulp of the tooth (Figs. 6 and 7).

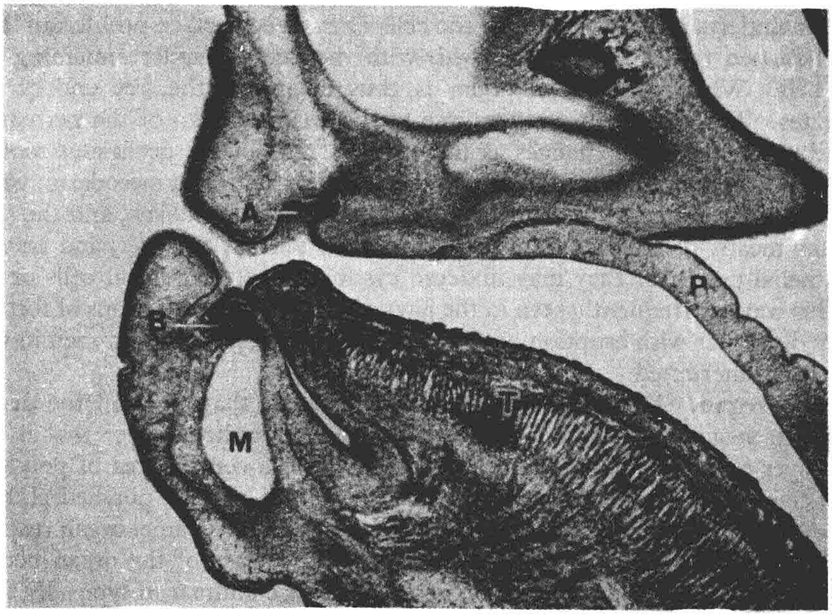


FIG. 6. Sagittal section through oral region of a 12-week embryo, showing tooth germs in both jaws. × 30.

A Tooth germ in maxilla
B Tooth germ in mandible
T Tongue
M Meckel's cartilage
P Palate

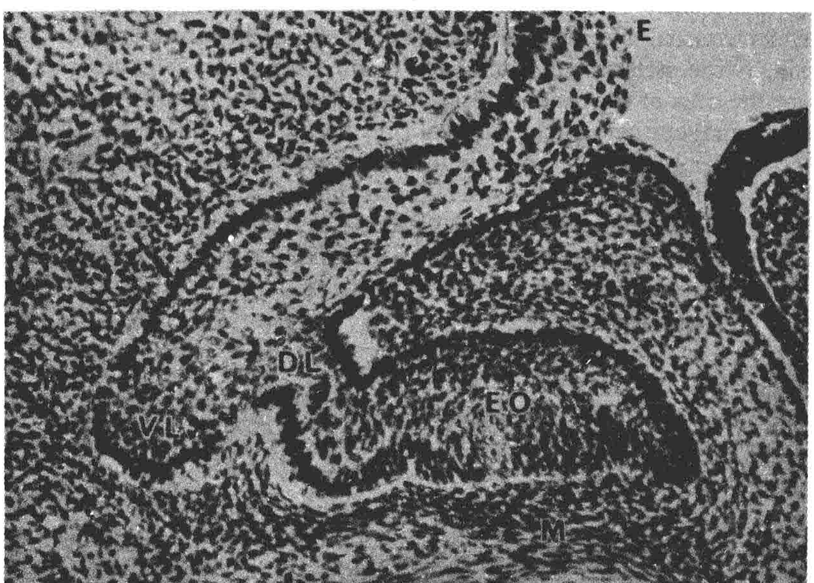


FIG. 7. Higher magnification of the mandibular tooth germ in FIG. 6. The oral epithelium has grown into the jaw to give rise to the dental lamina and tooth germ and the vestibular lamina. The tooth germ is at the cap stage and just deep to the cap can be seen the commencing condensation of the mesenchyme to form the dental papilla. × 200.

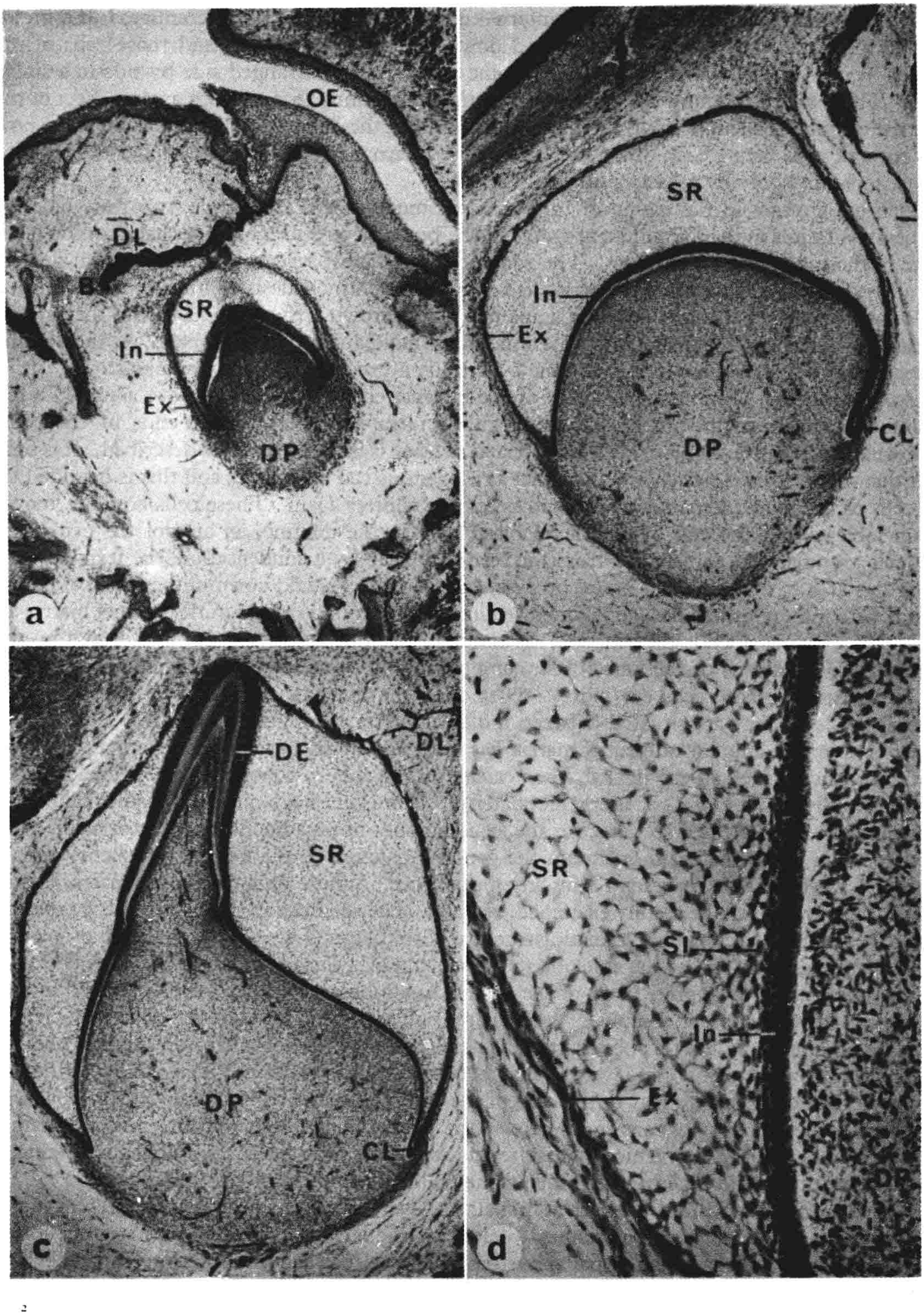
E Oral epithelium
VL Vestibular lamina
DL Dental lamina
M Condensing mesenchyme
EO Enamel organ

The cap-shaped enamel organ continues its growth, becoming elongated as it extends more deeply into the mesoderm of the jaw. Since the cells of its deep surface proliferate least rapidly it becomes bell-shaped rather than cap-shaped, with the dental papilla remaining within the cavity of the bell. While the enamel organ is thus enlarging, the free end of the dental lamina proliferates. This proliferation gives rise to the enamel organ of the permanent tooth, and it will go through the same changes as the enamel organ of the deciduous tooth. Subsequently, the dental lamina is penetrated by ingrowth of the surrounding mesoderm, which breaks it up into isolated groups of cells. The tooth germ now lies free in the jaw, and the remnants of the dental lamina mostly disappear. Some groups of cells persist, however, and may cornify to form small epithelial pearls, or they may undergo cystic change. Epithelial cells or microcysts originating in this way are frequently seen in the jaws of infants, and in sections of foetal material, but they mostly disappear with eruption of the teeth. Similar rests are often seen in the follicles of teeth that remain unerupted.

The Enamel Organ. As the aggregate of epithelial cells that buds off the dental lamina grows into the cap stage the cells differentiate to form a peripheral layer that is continuous with the basal layer of the oral epithelium and that encloses a central area of polyhedral cells. The peripheral cells are of low columnar type while the central cells are polyhedral, but changes take place in both these cell groups as growth proceeds. When the enamel organ reaches the cap stage those cells of the peripheral layer that line the deep surface of the organ become taller, while the cells lining the rest of the enamel organ remain low columnar in type. By the time the bell stage is reached four distinct layers or zones can be seen. These are (1) the external enamel epithelium, (2) the internal enamel epithelium, (3) the stellate reticulum, (4) the stratum intermedium (Fig. 8). The external enamel epithelium is that portion of the peripheral layer of cells that covers the convex surface of the enamel organ. These cells are of low cubical type. The internal enamel epithelium is the zone of the peripheral cells that lines the deep surface of the enamel organ, that is to say, the concavity of the cap or the hollow of the bell. These cells are tall columnar and will presently become ameloblasts and form enamel. The mass of cells that is enclosed within the external and internal enamel epithelium, and that forms the greater part of the enamel organ, is the stellate reticulum. To begin with these cells are much the same in appearance as are the cells of the oral mucosa, but following the differentiation of the outermost cells to form the enamel epithelium the internal cells become star-shaped and separated to some extent from one another by the accumulation of intercellular fluid, though they still remain in contact by means of intercellular processes. Those cells of the stellate reticulum immediately adjacent to the internal enamel epithelium are flattened, and constitute the stratum intermedium. The area where the cells of the internal and external enamel epithelium meet is the cervical loop. It is here that most of the further growth of the enamel organ takes place, and in due course the loop will become the root sheath of Hertwig.

FIG. 8. Consecutive stages in the development of the tooth germ. **a** and **b**, bell stage. × 30. **c**, dentine and enamel are forming. × 30. **d**, higher magnification of enamel organ to show the cellular layers. × 75.

OE	Oral epithelium	Ex	External enamel epithelium
DL	Dental lamina	SI	Stratum intermedium
B	Bud for permanent tooth	CL	Cervical loop
SR	Stellate reticulum	DE	Dentine and enamel formation
In	Internal enamel epithelium	DP	Dental papilla



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