A VISUAL DEMONSTRATION OF THE DEVELOPMENTAL STAGES OF THE HUMAN EYE

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INTRODUCTION

The development of the human eye has been treated rather extensively in the literature found in the scientific journals and is rather well established. Such comprehensive work has been carried on in years past, that the only active field at this time is that of an experimental nature. Much of the original work and all of the salient features of development are incorporated in the excellent textbooks that are now to be found in the field of Embryology. These plus other Journal sources thus provide the background needed for any treatment concerning the development of the human eye.

This dissertation is concerned primarily with a visual demonstration of changes that the human eye goes through until it reaches its mature state. Although various avenues of approach lay open to illustrate the dynamic development of the human eye, it was decided to use a plaster-model medium in this work. Various stages that would show progressive development from embryological tissues were then decided on. The finished product thus shows in four stages the complete embryology of the human eye from primitive primordia to the mature structures.

CONSTRUCTION AND EXPLANATION OF DEMONSTRATION

Plaster of paris blocks measuring 19 centimeters by 16 centimeters by one centimeter were first cast. From the plans previously drawn up, line drawings of the stages were made on the surface of each plaster block with a pencil. With hand tools, the areas delineated were then cut to illustrate the progressive development of embryonic primordia to adult structures. The final step in the actual finishing of the demonstration was the coloring of the models. For developmental aspects of each structure, the same color was used to show progressive elaboration of the same structure in successive models.

The first model illustrates a very early stage in the development of the human eye. Embryonic evidence for the eye formation is seen in the primitive pouching out of the optic lobe of the brain. This is shown in the model in an advanced stage. The optic vesicle thus formed then begins to invaginate. At about five weeks, the distal portion of the optic vesicle begins to flatten before invaginating. This condition is presented in the model. At the end of the fourth week or the beginning of the fifth week the ectoderm overlying the optic vesicle shows progressive thickening. The structure thus formed is the primordia called the lens placode. These structures which appear in the first model are to be found in embryos at 4.5 mm. stage.

The second model illustrates development which has been attained in embryos at the 5 mm. stage. The optic vesicle from its flattened condition has now invaginated to such an extent, that it makes an optic cup which consists of two walls. With the deepening of the cavity thus produced by the invagination, the lens placode, which by now has proliferated extensively from the overlying ectoderm, has moved into the cuplike space. The rapid movement of the epidermal cells to the inside forms a temporary lens pit at the site.

The 7 mm. stage shows further development to adult structures. The optic vesicle has invaginated to the extent that the two walls forming the cup are in close proximity, thus reducing the space between to a narrow slit. This structure is now referred to as the optic cup. Evidence of activity is noted in the optic cup in these embryos. The outer layer becomes progressively thinner and by the sixth week begins to show melanin granules. This stage is the one illustrated by the model. Later this structure will become the melanin pigmented layer of the retina.

Conversely progressive thickening of the inner layer produces the sensory layer of the retina. While these developments have taken place, the lens vesicle becomes closed. The choroid fissure, a groove in the extension from the brain, is at this stage well developed.

The 10 mm. stage in the development of the human eye shows

the main structures that by further differentiation and growth will produce the mature organ. There is growth both in overall size and in thickness of the sensory layer of the retina. The pigmented layer of the retina shows further deposition of melanin pigment. The sensory layer of the retina now proliferates rapidly and grows into the choroid fissure thus forming the primordia for the optic nerve. The lens vesicle at this time has closed completely and breaks away from the ectodermal wall. This rounded epithelial structure lies in the opening of the optic cup. Before the end of the sixth week, the cells on the deep pole of the lens elongate thus beginning the transformation that will eventually form the lens fibers.

CONCLUSION

As a visual demonstration of the developmental aspects of the human eye these plaster of paris models highlight the main stages. All of the essential primordia in the developing eye are followed closely through successive changes. The stages chosen show definite continuity bringing out the dynamic aspect of the embryology of this organ. Such a demonstration proves an invaluable aid in the understanding of the development of the human eye.

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