

A STUDY OF THE CAUSES UNDERLYING THE ORIGIN OF HUMAN MONSTERS. Franklin P. Mall, *Jour. of Morph.*, Vol. XIX, Feb., 1908.

The recent publication by Mall on the causes underlying the origin of human monsters marks an epoch in the study of teratology in this country, for he has treated the subject with a breadth of view and a wealth of illustration rarely found in the handling of this complex question. Mall has brought to the task a profound knowledge of the older literature of the subject, an appreciation of the most modern results in experimental teratology, and a thorough familiarity at first hand with the subject of human monsters. The physician and anatomist are brought into close touch with the work generally supposed to be outside of their proper field; and on the other hand the student of malformations in the lower animals will be made to appreciate the inexhaustible supply of human materials with which the anatomist and physician are familiar. Mall's material consisted of 163 pathological human embryos that include nearly all of the commoner forms of human abnormalities. He points out, that from the earliest ages the study of monsters and the causes that produce them have been two of the capital problems of anatomy, medicine and natural history; that the ancient belief of their supernatural causes has been replaced in part by the theory of maternal impressions; that this belief also has gradually been replaced in turn by the theory that monsters are germinal or else produced by external causes adverse to the normal development of a normal germ cell. Recognizing that some of the monstrous forms may be germinal, Mall argues with great ability that the great majority of monsters such as anencephaly, spina-bifida and cyclopia are due to external agencies affecting the germ, chief amongst which he recognizes faulty implantation of the embryo in the uterus. Faulty implantation by interfering with the nutrition of the embryo is recognized as the chief mechanical factor in producing the result. When it is recalled that the human ovum is extremely small at its beginning, that it is without a store of yolk and must depend for its growth on materials absorbed from the mother through the placenta, there can be little

doubt that Mall has indicated the chief sources of abnormal development. On the other hand, nutrition *per se* is probably not the only cause, for an abnormal condition of the uterus implies the formation of injurious substances, and these, aside from nutrition, may affect the normal sequence of changes. Mall recognizes in fact such conditions as another source of imperfection. He is less favorably inclined to the supposed influences of adhesions, strangulations and the like, and suggests that such fusion and restraints are of secondary rather than of primary importance. To the reviewer it seems that too little weight is attached to these factors, although it is clear that too great weight has often been given to them, and on the whole Mall has done good service in drawing attention away from these towards the other more prolific sources of malformations. Mall's observations that "in very early stages the amnions and embryos are equally susceptible, and the umbilical vesicle and chorion are the most resistant" while "later it is the embryo alone and still later the head, central nervous systems and extremities" that are most affected is a generalization of great importance.

It is pointed out that, while the earlier of the modern teratologists were first inclined to the view that polyspermy is the cause of double monsters, later researches have rendered this view improbable. The early separation of embryonic cells has been shown to produce directly double structures. Almost identical results have been obtained, however, by artificial constriction of later stages. In passing it is also interesting to note that results, externally indistinguishable, may be also produced by chemical reagents.

From details in Mall's monograph concerning pathological ova in relation to the conditions in the uterus; for the cases in which successive births have given rise to pathological embryos; for the relation between tubal pregnancies and abnormalities, etc., the reader must be referred to the able treatment of the problems involved. There is open here a wide field for experimental study on lower mammals where the conditions might be artificially induced.

Following the custom of human embryologists Mall speaks of the earlier embryos and their membranes as ova—a term that will not recommend itself to the student of general embryology, for here the ovum has a distinct and definite meaning.

The embryos that Mall has studied are grouped according to "weeks" from the second to eighth week. It is impossible in a brief review to do justice to the interesting facts here considered. In all, 138 pages are devoted to this general treatment of the problem; the remaining 223 pages give the data for the individual cases considered.

This great monograph on human teratology should excite widespread interest in this important field of anatomy. The standard here set in the treatment of the questions involved is certain to have a beneficial result on the study of normal and pathological anatomy in this country.

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