and right clavicle. The vault of the skull was very vascular, very soft, and removed with great ease by the saw. The dura mater was adherent at the vertex for about 2 in. on either side of the falx cerebri, and was removed with the skull-cap. The thickness of the calvarium for the most part was from $\frac{3}{8}$ in. to $\frac{1}{2}$ in.; just behind the right frontal region it measured 1 in., and in the occipital bone varied from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. Both inner and outer tables had increased in thickness, while the cancellous tissue was not particularly altered, except at the two places just mentioned as the sites of greatest expansion, where it shared in the general enlargement. The sutures were not obliterated. The inner surface of the vault presented a striking appearance. The posterior half was, generally speaking, smooth, but the channels for the vessels, which were unusually numerous, were very conspicuous and much deeper than normal. The anterior half presented a congeries of confluent flattened bony bosses, varying in size from that of half a walnut shell to a pea; these were particularly well marked in the frontal bone on either side of the longitudinal sinus; there was no definite symmetry in their arrangement. The right frontal sinus, which was of considerable size, had been opened by the section. The dura mater was much thickened, especially along the vessels. A portion of it and of the falx has been preserved with the calvarium, to which it was very adherent. The thickening was very marked, and was irregular in amount and distribution. Thick fibrous bands stand out upon its inner surface.

The clavicle on section showed the central medullary canal obliterated by coarse rarefied bone. Patches of medullary tissue persisted towards the extremities, where it was broken up by similar coarse trabeculae. There was considerable subperiosteal thickening of the shell of the bone, which had largely lost its compact structure.

The brain was normal in size, and on section showed no signs of any gross lesion. The blood vessels were comparatively good.

Dr. S. G. Scott, who prepared and examined sections of the bone, reports as follows:

Sections through the skull in the parietal region show a thin layer of bone arranged parallel with the fibres of the periosteum. The inner parts of the section are composed of regular trabeculae of bones surrounded by connective tissue composed of delicate fibrils and no great number of cells. Blood vessels are abundant in it, and are continuous through holes in the outer layer of bone with those of the periosteum.

At the edges of the bony trabeculae, often in shallow depressions (Howship's lacunae), are a good many cells, some of them myeloplaxs which are presumably osteoclastic in function. Marrow is scanty, but cellular and fatty marrow is seen in the inner parts of the bone here and there. These appearances appear to coincide with the usual descriptions of the disease, and, with one exception, do not traverse the accepted views of the morbid process—namely, that there is a formation of soft new bone, mainly from the periosteum, and a great widening of the Haversian canals by absorption of pre-existing and new-formed bone.

The exception is the use of the termination "itis." There is no evidence of inflammation in this specimen, and in the descriptions I have met with the evidence appears equally scanty. Histologically this specimen is no more inflammatory than is a normal growing bone, but the term "osteitis deformans" is so well established that nothing would be gained by suggesting an alteration of nomenclature.

Notwithstanding this expression of opinion of Dr. Scott's the writer feels strongly that the changes in the dura mater which were such a conspicuous feature in the case would be generally regarded as inflammatory, and very probably may have had a close connexion with the cerebral symptoms and the mode of death.

THE Council on Defence of Medical Research of the American Medical Association has recently issued five pamphlets which should serve to enlighten public opinion in regard to the value of animal experimentation. The following are their titles with the names of the authors: (1) *Vaccination and its Relation to Animal Experimentation*, by Dr. Jay Frank Schamberg of Philadelphia; (2) *Animal Experimentation and Tuberculosis*, by Dr. E. L. Trudeau of Saranac Lake, N.Y.; (3) *The Role of Animal Experimentation in the Diagnosis of Disease*, by Dr. M. J. Rosenau, director of the Hygienic Laboratory of the United States Public Health and Marine Hospital Service; (4) *Animal Experimentation and Cancer*, by Dr. James Ewing of New York; (5) *The Ethics of Animal Experimentation*, by Professor James Rowland Angell, head of the Department of Psychology of the University of Chicago.

THE DEVELOPMENT AND MALFORMATIONS OF THE GLANS AND PREPUCE.

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It is by no means uncommon to find in the newly-born male child that the prepuce cannot be retracted from the glans of the penis.

In performing the operation of circumcision upon infants this condition is frequently met with, and it is spoken of as congenital phimosis or "adherent prepuce." Further, in a very large proportion of all newly-born children some "adhesions" have to be broken down before the prepuce can be retracted from the glans.

Some degree of "adhesion" is normal, and in regarding such adhesions as being the products of inflammation—or as anything other than entirely natural processes of development—an incorrect idea is gained of the condition, and an interesting page of embryology is overlooked.

These "adhesions" are the outcome of the normal method of development of the glans and prepuce, and the misconceptions concerning them result from the incorrect accounts of the development given in most textbooks. Put briefly, this incorrect account describes the tip of the genital tubercle as being the glans of the penis, and pictures the prepuce as growing forwards over it as development proceeds. The prepuce is therefore regarded as a hood-like fold of integument which grows over a previously exposed glans.

The state of affairs as actually seen in embryos at various stages is entirely different to that just pictured; for the tip of the genital tubercle is a skin-covered papilla, within which the future glans is sculptured out by the invasion of a mass of epithelial cells. A correct account of the process was given by Dr. Berry Hart when he first described the curious phases in the development of the genital passages, and more recently he has gone into the question in more detail¹ and has figured the changes which take place in the glans and prepuce of the fetus. In 1902, without being acquainted with Dr. Berry Hart's paper, I described and figured the process of development of the same parts, and in the *BRITISH MEDICAL JOURNAL* of December 17th, 1904, I briefly mentioned it. In all respects my results were the same as those previously arrived at by Dr. Berry Hart.

Since the whole process of the development of the external genitalia wears a somewhat different aspect when this method of formation of the glans is accepted, it will be well to recapitulate briefly the various stages seen in the developing embryo.

1. The genital tubercle appears as a little papilla raised from the general surface of the skin (Fig. 1).

Fig. 1.—The genital tubercle, showing the urethral groove and inner genital folds confined to its base.

Fig. 2.—Showing the start of the formation of the glans. In the female the glans is early exposed owing to the spreading apart of the inner genital folds.

2. The inner genital folds mark the edges of the urethral groove, and it is to be noted that the tip of the genital papilla is never invaded by the urethral groove. It is knob-like, and is free from the lines of the inner genital folds. This is the portion of the genital tubercle wrongly called the glans (Fig. 1).

3. In the female the inner genital folds remain open, and when the epithelial ingrowth takes place at the tip of the genital tubercle, the glans which is formed with it soon becomes exposed (Fig. 2).

4. As the inner genital folds become more widely separated in the growing female fetus the glans becomes

freely exposed within its prepuce. A like condition of congenital paraphimosis is developed in males born with any degree of hypospadias. The inner genital folds in the female form the labia minora, but the prepuce of the clitoris is formed quite independently by the ingrowth of

Fig. 3.—Showing the fate of the inner genital folds in the female, and the independent formation of the prepuce of the clitoris from the skin of the tip of the genital tubercle.

Fig. 4.—The condition in the male. The inner genital folds have met and formed the raphe, which does not extend to the tip of the penis.

the epithelial mass into the tip of the genital tubercle (Fig. 3).

5. In the male the inner genital folds meet in the middle line to form the raphe, which does not extend to the tip of the genital tubercle. The genital tubercle

Fig. 5.—The condition in the male when the glans is completely formed and the prepuce is retracted.

Fig. 6.—Section of the genital tubercle of the male. The dark mass represents the epithelial cell mass which has sculptured out the glans, prepuce, and terminal part of urethra, but has not yet broken down.

remains as a skin-covered papilla, swollen at its distal end (Fig. 4).

6. Into the distal end of the genital tubercle the epithelial cell mass grows, and it sculpts out the glans from the overlying skin. The cell invasion also burrows into the glans itself, and forms the urethra (at first as a solid plug) within the glans (Fig. 5). In the female fetus

Fig. 7.—Section of the penis of a full-term male fetus in which the terminal ingrowth of epithelial cells to form the glans and distal portion of the urethra has altogether failed to develop.

Fig. 8.—Section of the penis of M. H. at birth. The glans is free from the prepuce over a very small area in front, in all other parts it is still fused with the prepuce. The terminal part of the urethra is formed. Normal fetal condition.

a similar invasion to form the distal portion of the penile urethra takes place, but it ends blindly, and later on it disappears.

7. The terminal portion of the urethra is hollowed out, and the prepuce set free from the glans, by the breaking down of the central cells of the invading solid plug. (Fig. 8.) The urethral plug is broken down by the seventh

month of fetal life, and the fossa navicularis and lacuna magna are formed; but by this time the separation of the prepuce is scarcely begun. The breaking down of the preputial plugs is frequently not completed at birth. In a monkey at full term the corona is still occupied by a solid mass of cells, and the prepuce is only liberated in its fore part.

This normal method of formation may be arrested at any point.

1. The epithelial plug may altogether fail to develop and to invade the tip of the genital tubercle. In such a case (Fig. 7) no glans or prepuce is ever formed, and the portion of the urethra distal to the urethral groove is altogether wanting. Such is the condition of simple imperforate urethra, comparable to a case of imperforate anus. In the example figured the kidneys were functionless, and no distension of the urinary passages had taken place.

2. The epithelial ingrowth may be developed, but may fail to break down in whole or in part. In such a case (Fig. 8, M. H.) it is impossible to retract the prepuce, for no glans—in the ordinary sense of the word—is developed. The urethra opens upon the tip of a skin-covered genital tubercle. This is the normal condition at about the sixth month of fetal life. In lesser degrees of this malformation the prepuce may be free above but firmly blended with the glans below; such a case (W. B.) is figured in Fig. 9.

3. Without any failure in development, the epithelial plug may invade the glans in a variety of ways, so causing variations in the position of the urethral orifice; or it may meet the proximal part of the urethra at a variety of angles, so causing sinuses and diverticula about the lacuna magna (Fig. 8.)

Fig. 9.—Section of the penis of W. B., aged 54. The prepuce is free above; but below, the division between glans and prepuce has never taken place.

REFERENCE.

¹ *Journ. Anat.*, vol. xlii; fourth series, vol. i.

PRIMARY EPITHELIOMA OF PENILE URETHRA.

By WM. ERNEST PEACOCK, M.D. DURH.,
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As I have been unable to trace the record of a case similar to the following—that is to say, an instance of penile epithelioma inside the urethral canal—the case seems worthy of record on account of its extreme rarity alone.

On August 6th, 1907, a man, aged 74, complained of indefinite pains in the lower abdomen, back, and rectum. He was of gouty habit. The urine did not contain albumen, but there was excess of urates.

History.—He had suffered from the pains for two or three months, and when in London in July, 1907, had consulted a physician, who thought his symptoms were due to some growth in the bladder, and advised cystoscopic examination, but this was refused.

In September, in addition to the pains “across the bladder,” he had some soreness and pain on micturition, with irritation round the glans penis. A discharge around, and the moist condition of the glans, was found to be due to a secretion of the coronary glands. The urine was carefully examined for sugar, which is a cause of discharge sometimes in old people, and has been mistaken for gonorrhoea. A catheter (No. 14 English) was passed quite easily, and nothing abnormal found in the bladder or urethra. A mixture of potassium bicarbonate, urotropine, and potassium bromide relieved the pains a good deal, and the balanitis was treated with a mild mercurial ointment and a starch powder, with calomel.

The patient continued to complain of the pains in the lower abdomen and back, sometimes of a shooting character and occasionally quite acute. I could detect nothing abnormal in the abdomen nor on rectal examination. The sphincter was, however, a little tight, and I believe during defaecation sometimes the muscle was in a state of spasm due to reflex irritation. This condition recalls a note from Mr. Heath, made in my student days, of the sympathy existing between the rectum and the urinary apparatus, and recalls, too, several instances in