degree of rigidity to render it easy to handle and to thread into the needles, and the knots are, I think, more secure than with any variety of wet catgut.

Except for sutures in the mouth I always use it dry, the glass slip carrying the catgut being simply tilted out of the tube on to the instrument tray. In the mouth, however, iodine catgut seems to cause an undue amount of pain, therefore when any intra-buccal operation is in view the catgut is placed in sterile salt solution to wash out the excess of iodine.

The sizes I use are Nos. 0, 2, and 4. No. 0 when a great number of small ligatures is required, No. 2 for the peritoneum and most ligatures, No. 4 for muscles and aponeuroses. More and more, however, I find myself using No. 2 only for all purposes, and obtaining any desired variations in additional strength by multiplying the number of strands—three strands for ligating a pedicle, two strands for the abdominal aponeuroses, one strand for ordinary ligatures, etc.

These sizes seem unnecessarily large, and were it a question simply of the material being strong enough to withstand a certain tensile strain, that would be true, but there are other important factors to be considered.

The first is the lack of uniformity in the standardization of catgut. The various sizes correspond to no definite gauge. I have made some measurements to determine the thicknesses of various samples, taken by chance, from the stock of unprepared catgut which happened to be in my possession. The nominal sizes were Nos. 0, 2, 4, and 6. The instrument I used for the measurements was an ordinary Imperial Standard wire gauge. No. 6 catgut was fairly uniform, about 21 w.g. No. 4 catgut varied from 22 w.g. to 24 w.g.; in one packet, supposed to contain No. 4, samples measuring 22, 23, and 24 w.g. were found. No. 2 catgut varied from 23 w.g. to 26 w.g.; specimens corresponding to 24 w.g. and 26 w.g. being found in the same packet. No. 0 catgut varied from 26 w.g. to something decidedly finer, which I could not measure, as the gauge does not go beyond No. 26; it would be necessary to use a micrometer to verify the thicknesses of the finer sizes. These variations in thickness of course correspond to enormous differences in tensile strength between various specimens which are nominally of the same size. These variations in thickness and in tensile strength entirely corroborate the statement of our theatre nurse, who, after having been blamed for getting her sizes mixed and for the occasional brittleness of the material, complained that the sizes put up in the same packet, and nominally of the same thickness, really varied enormously, the differences being perfectly obvious to the naked eye. A point which attracted my attention when making these measurements was that some dealers label their catgut No. — corresponding to — w.g., while others simply label it No. — and make no reference to the wire gauge to which the number is supposed to correspond, and it was further noticeable that the catgut belonging to the latter group, distinguished only by a number, showed a decided tendency to fall below the standard of thickness presented by corresponding sizes in the first group. I therefore think it would be advisable for any surgeons who are particular about the sizes they use to specify the wire gauge wanted rather than numbers, which apparently mean very little, when ordering their catgut.

Further, there are sometimes considerable variations in tensile strength owing to defects in samples of catgut of similar sizes. The tensile strengths of all materials are diminished when they are bent or kinked; this is notably the case with catgut, where a simple knot involves a very considerable diminution.

Catgut, especially the smaller sizes, tends to cut in the knots, even more than fine silk does; this is often the cause of breaking in cases where the material shows a quite satisfactory degree of resistance to a direct strain.

Of all materials used for surgical ligatures and sutures, with the exception of silkworm gut, catgut is the one in which the knots are most insecure. There is some difference, according to the variety of catgut, but all suffer from the same defect. Any one can demonstrate this for himself by tying two pieces of catgut together and then pulling on the long ends. If the catgut is fairly strong the knot is just as likely to slip as the material is to break, whereas with silk or linen the knot will always jam and the thread break if the strain is continued. The type of knot—

surgical knot, reef knot, or granny knot—makes very little difference—one is just as likely to slip as the other; to my thinking the greatest security is obtained by tying the second turn of the knot very tightly, by adding a third turn to the knot, by using two finer strands rather than a single heavier one, and by leaving the ends fairly long.

For these reasons I think it is advisable to have a considerable margin of strength in the catgut employed, and, after all, the thickness is not of much moment if the material is soon absorbed.

With regard to the length of time plain iodine catgut lasts in the tissues, I am unable to speak very definitely; clinically I can say that I have no reason to think that it has in any case been absorbed too soon. When No. 2 dry iodine catgut was used experimentally as a skin suture to determine its resistance to absorption, the subcutaneous parts of the loops showed signs of erosion, but were still strong after fourteen days. In one case, where the abdomen was reopened on the eighth day, both No. 2 and No. 4 catgut were found to be perfectly distinct and strong. In another case, where the abdomen was reopened on the twelfth day, parts of both Nos. 2 and 4 were found to be still quite strong, but the sutures were so closely blended with the healed tissues that it was not possible without undue waste of time to follow them up. On the whole, I think that No. 2 plain iodine catgut lasts for about fourteen days in the tissues, and No. 4 for a few days longer.

To sum up, my experience of dry iodine catgut prepared and preserved as above described is:

1. It is aseptic.
2. Its tensile strength is satisfactory.
3. It remains aseptic and strong for years.
4. It is smooth, does not kink, is easily handled, and is easily threaded into the needles.
5. The knots are as secure as with any kind of catgut.
6. The iodine with which it is impregnated causes no trouble in the tissues.
7. It resists absorption for a sufficient time.
8. In private work it does away with the necessity for carrying about a jar containing iodine solution; I think that this is a decided advantage, although some very handy little jars with metal cases and spring caps to prevent leakage have been devised.
9. As each hank occupies a separate tube there is no possible risk of the stock being contaminated when taking out a portion for use; this is a point of considerable importance, in view of the absence of a protecting antiseptic solution.
10. The preparation is simple and easy.
11. It is not a good material for skin or intestinal suturing.

For a very thorough detailed account of the qualities of dry iodine catgut I would refer any one who is interested in the subject to the paper by Moschowitz which I have already mentioned.

At one time I tried the Salkindsohn catgut, but soon gave it up. If it lay for any length of time in the iodine spirit it became too hard; if when about to be used it was placed in water or an aqueous antiseptic solution, it quickly swelled, kinked, and became very elastic; and if not immersed in fluid, it became so dry and hard as to be unmanageable.

REFERENCE.

¹ *Annals of Surgery*, September, 1905.

A CASE OF OSTEITIS DEFORMANS TERMINATING WITH CEREBRAL SYMPTOMS.

By REGINALD G. HANN, M.R.C.S., L.R.C.P.,
LEEDS.

THE patient came under observation in 1902 at the age of 60. She was married at 22, had her only child (a daughter) at 24, and enjoyed good health until she was 40, when the right clavicle became prominent and rapidly attained its maximum growth. It caused no discomfort, and she paid no attention to it. At this time her limbs and body were undoubtedly perfectly straight. At 51 she began to ail, and from that time onwards was never in even moderately good health; she suffered from constant

headache and pain in the thighs, and her legs began to lose their shape and to bend, though the commencement of the enlargement of individual bones was not noticed.

As movement made her pains worse she gradually drifted into a bedridden existence. When first seen, in August, 1902, she was a dull and unintelligent old woman, always drowsy, spending her time in bed or on a chair without power to get about or any desire to occupy herself. Her surroundings were and had always been of the poorest. The outstanding feature of the case was the widespread alteration in size and shape of the bones. In the head the enlargement, which was very marked, affected the cranial bones and not the facial; the maximum circumference of the skull was 25½ in., and from one external auditory meatus over the vertex to the other was 15 in. In the spine there was an extensive dorsal kyphosis. The right clavicle was enlarged, as is well shown in the photograph. The spines of both scapulae and the left ulna in its upper part and parts of the pelvic brim were all thickened and stood out prominently. There was a projection of the right side of the chest due to enlargement and bending of two or three ribs. Both femora and both tibiae were greatly thickened and bent forwards and outwards, producing a condition of bow leg so extreme as to make it impossible to stand without crossing her feet. There was no tenderness of any of the affected bones, unless it might be of the tibiae, but as the legs were always oedematous it was not easy to be sure that the discomfort caused by pressure was due to tenderness of the bone.

The arteries were rigid and tortuous. The skin was persistently moist, and had a tendency to sweat profusely without obvious cause. The hair was plentiful and in good condition. An appearance of slight anaemia was scarcely supported by the result of an examination of the

blood by Dr. Chaplin, who reported the red cells to be 4,300,000 and the white cells 7,510 per c.mm., the haemoglobin being 87 per cent. (Gowers's method). Taste and smell were normal; the sight and hearing were bad, and her memory had failed.

Dr. Chaplin also examined the urine, and reported that it contained no albumen, casts, or sugar. The chlorides, sulphates, and phosphates were normal. Indican was present.

Total solids by Christison-Tyson's formula, 46.6 (500 c.cm. examined). Quantitative estimate of urea:—

$$\frac{20 \times 53.5}{354} = 3.002 \text{ urea per cent.}$$

Reaction acid; specific gravity, 1020.

During the subsequent years of her life no noticeable alteration in the bones took place, except in those of the head; its circumference increased from 25 in. in August, 1902, to 25½ in. in October, 1906, the increase being largely due to an outgrowth which filled up the right anterior temporal fossa. During the whole of the time the headache

was constant and severe, and never relieved by drugs. She gradually deteriorated mentally and physically, and

during the summer of 1905 was found one morning by her relatives unconscious in bed. She is said to have remained in this state for the next few weeks, quite oblivious to her surroundings, making no effort to speak or to feed herself, and having no control over the rectum or bladder. Then improvement slowly set in, and she recovered the power of speech and began to recognize her relations. The incontinence ceased. She is said to have had a similar seizure a year later and recovered, though perhaps not so fully; and, finally, on January 5th, 1907, she became comatose, and remained so until her death on January 7th. In this last illness there was

no palsy or alteration of reflexes. Unfortunately she was not under medical observation during the first two attacks. The *post-mortem* examination was limited to the head

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