ABSTRACT OF LECTURES ON THE STRUCTURE AND FUNCTIONS OF THE VERTEBRATE SKELETON.

Delivered at the Royal College of Surgeons of England.

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LECTURE II.

It is by no means easy to tell which part of the head in the early embryo is the terminal end of the body, from the circular manner in which the primary vesicles are placed. The most prominent part (which is composed of the middle vesicle) is not the termination, but the vesicle which lies underneath it—the fore-brain. This view is favoured by a study of the development of the cranium and notochord. The notochord has been traced up along the basis cranii as far as the posterior clinoid process, in which it forms a hook by bending over of the notochord. As far as this point (the posterior clinoid process of the sphenoid) the development of the skull and spinal column has been clearly demonstrated, but there exists great varieties of opinion regarding the development of portions anterior to this; as knowledge is gained regarding the various arches of the face and their morphology, so will the development of the anterior portions of the cranium be explained.

The vertebrate kingdom is divided primarily into two great groups, namely, the anamniotic and amniotic vertebrates, according as the embryo possesses an amnion or not. The first group contains only one subdivision, viz., the ichthyopsida, which comprises the fishes and the amphibia; while the amniotica contains two: the sauropsida, which includes the reptiles and birds, and the mammalia, which are usually classified into non-placental and placental, according as they possess or do not possess a placenta. The young of the anamniotica are developed directly upon the ovum without any amnion, allantois, and chorion. In adult life, some of them acquire what may be taken to represent the allantois, but it has no allantoic function. Of this group, the lamprey and the frog are taken as the type specimens, the former being the lowest and the latter the highest in development. Of the next group—the sauropsida—the lizard may be taken as the type. The development of the two classes of this group, namely, the reptiles and birds, is for a considerable time alike; so much so, that one description is applicable to the embryo of both. It is not till the embryos have developed to about 9 millimètres in length that they begin to diverge, the beak of the bird becoming gradually longer. This takes place between the sixth and ninth days of incubation. One distinguishing peculiarity of the sauropsida is that the skull possesses only one condyle, which is formed as a ball-and-socket joint. The mammalia not possessing a placenta are a limited subclass, containing only the monotremes and marsupials, though the former may almost be considered an intermediate stage between the sauropsida and the mammalia, so widely do they differ from true mammals. The great majority of the mammalia belong to the placental group. The lowest of these are probably the insectivora and edentata, and the highest bimana, of which man is the only representative.

LECTURE III.

In the early embryo, there is only an axial skeleton developed in the first instance, and it is not till a later period that the extra-axial parts appear. The earliest part of the extra-axial skeleton to be developed is the labial skeleton, or the skeletal parts around the mouth; the next parts we find are the extrabranchials, which appear in the form of bands supporting the branchial arches. After those, we find the basis cranii developed. This is formed, in the first instance, in cartilage, which in most cases becomes ossified. The mandible and hyoid bone shortly afterwards appear, and immediately afterwards the intrabranchials. The vesicles of the brain are covered over by the gradual extension upwards on each side of the ossification of the superficial parts of the cranium, which became the parietal and frontal bones. About this time, the segmental spinal column appears as a series of paired cartilages, over the myelon, enclosing the notochord. An elongated head seems to have been the particular form of that part of the body in the early condition of all the low forms of vertebrates, and can still be seen in the lancelet. In those forms, the vagus nerve can be seen to come out between each respiratory cleft, and immediately divide into two branches. Before the head is completely formed, the spinal cord makes its appearance. This it does by a groove forming in the epiblast,

which becomes converted into a tube by the sides of the groove enlarging and approximating till they unite. The layer of the hypoblast also increases in size, and forms the digestive tract. Between the two layers appears a third layer of cells, called the mesoblast; from this are developed all the structures which lie between the epidermis and the digestive tract. The mouth does not exist at first, but is formed afterwards as an involution, which is probably not terminal, as the alimentary tract possibly extended beyond the mouth in ancient forms. The limbs appear, in the first instance, as thickenings in the body-wall, consisting of masses of cells which soon form themselves into small cartilaginous plates. They then assume the form of buds, the extreme terminations of which are quinquifid, projecting from the sides of the body. These at a later stage have increased in size, and become supported on frameworks of cartilage which gradually ossifies as the embryo becomes older and more mature.

The rigidity with which nature adheres to typical numbers of segments and organs in the body is very remarkable, and when a deviation from the number has taken place in any particular form, there is constantly a tendency to return to the original number, although great variations in the particular structure or organ may have occurred. Examples of this are seen in the gills of fishes and in the number of segments of the fingers and toes, although the former become modified in the thumb; that is, however, explained by its being one of the series, that has a new function assigned to it.

EXTROPHY OF THE BLADDER.

By J. GREIG SMITH, M.A., C.M.,
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It is to me a matter of sincere regret that, in my paper describing two cases of operation for extrophy of the bladder, I neglected to give due prominence to the highly distinguished labours of Professor Wood in this department of surgery. So closely is his name connected with the successful treatment of these cases, that it would be absurd for anyone to undertake similar operations without, in the first place, mastering the methods he pursues. To every surgeon these are, in a general way, so familiar, that I thought it unnecessary to occupy the limited space at my disposal by referring to them. No one could suppose that I had not profited greatly by his labours, as, indeed, I hope I have profited by the labours of others in the same department.

That Mr. Wood (probably through my fault) misunderstands my plan of operating is evident, partly from his statement that it differs in no important particulars from his own, and partly from his criticism of procedures I never instituted. But there is one point on which, I think, the fault is not with me. If Mr. Wood "has never in his now numerous cases employed hare-lip pins so as to include both thicknesses of the transplanted tissue", how are we to interpret these words of his?—"Three hare-lip pins were then passed across the median line from one of the superficial flaps to the other, each being made to transfix the deep or reversed flap, and so to hold the three firmly together." And, if I have erred, it has been in good company, for Erichsen writes: "The flaps are then secured in position by hare-lip pins, each pin passed so as to transfix both the groin flaps and a fold of the umbilical flap beneath, holding the three firmly together." Now, I know that "a fold of the umbilical flap" means "a small piece of connective tissue"; but I think that, from the language I have quoted, most people would have drawn the inference that I did. Still, I fail to see how flaps can be "held firmly together" by small pieces of lax connective tissue; and, seeing that the blood-vessels lie in this connective tissue, the firm holding and compression are of that very tissue we wish to conserve. And, even if the analogy of the hare-lip operation were correct (which it is not, differing as the tissues do both as to direction and as to abundance of blood-supply), no amount of argument will convince anyone that a straight body can enter a plane at one point and come out at another, without causing a flexure of that plane. Lastly, if none of the evils I dreaded follow the introduction of hare-lip pins, on what grounds, may I ask, has Mr. Wood, after his great experience, given up the proceeding which I, on purely theoretical principles, rejected from the first?

Mr. Wood's further criticisms are of procedures I did not institute; and I am warned to beware of contingencies which can never occur. "The strain upon the sutures (central, he must mean, for he uses no other) in this operation depends almost solely upon the forcible protrusion of the hinder wall of the bladder by the action of the expiratory muscles, and no operation which does not take this condition into account will succeed." This may be so in Mr. Wood's operation; it is not so in mine. The protrusive force of the respiratory muscles was ignored; no strapping or any other adhesive agent, such as he employs,

was used; so far as tension was concerned, sutures might have been dispensed with altogether; the feeblest of restraining agents, to prevent the natural resilience of the skin, were used and succeeded. The abdominal flap, by its fixation around the abdominal opening, and by the silver loops over the India-rubber tubing, resisted abdominal tension; the groin-flaps suffered no tension whatever. It seemed to me a serious drawback to the probable success of the operation: first, to permit any strain at all on the sutures uniting the groin-flaps; and, secondly, not to keep the incisions free from contact with urine. This could be prevented only by transferring the tension to the under flap, and by so closely approximating the edges of this flap to the abdominal opening (by elastic compression) that urine could not reach them. Neither of these contingencies is provided against in Mr. Wood's operation. Again, fixation by strapping across the transplanted tissues must be a positive evil, tending to cause sloughing by compression. Compression by the herniated bladder, even on the abdominal flap, does little harm, for resistance is offered by the dense epidermis within, and is scarcely felt on the lax connective tissue outside.

When he says, "Such an elongation of the flap, so far from its vascular connections with the abdomen, and subjected to the pressure of the resilient dartos and the tension of the scrotal skin brought over it, I have found to result frequently in sloughing or atrophy", Mr. Wood must be thinking of his own operation, not of mine. There is neither scrotal skin nor resilient dartos over the penile flap to compress it. The upper covering of the penile flap was got partly from the mucous membrane on the floor of the urethra, partly from the sides of the penis; and the scrotal skin was dissected up, not with a view to transplantation, but that, by stretching out the corrugated folds of skin, more freedom might be afforded for raising the groin-flaps over the umbilical flap. Retention of urine in these cases, first noted, I believe, by Neudörfer of Prague, is more likely to depend upon the abundant muscle naturally existing at the neck of the bladder, than on the sparse fibres of the transplanted dartos; and the probability of retention taking place may be increased by a judicious management of the incisions at that part.

"As the upward contraction of the cicatrix progresses, and the child grows, the opening left at the root of the penis will enlarge, etc." The opening is not at the *root* but at the *point* of the penis. Contraction of cicatrix can, in my cases, only do good by diminishing the calibre of the urethra; and, if it draw up the abdominal flap, it must draw the neck of the bladder and penis with it. Again and again I dwelt upon the importance of avoiding this contingency, which, in Mr. Wood's cases, usually demands a second operation; I particularly noted the fact that this contingency had been avoided. The further plan of completing the formation of the new penis which I adopted is, I think, that of Thiersch, and is entirely different from Mr. Wood's second operation.

If Mr. Wood will again do me the honour of looking over my paper, he will, I think, see that, if an "unfortunate chance" have to be credited with the introduction of his name, a deliberate intention guided me in describing the peculiarities of the operation. So profoundly was I impressed with the consummate skill he exhibited, that I built my chief hopes of success on endeavouring to make stronger the least strong points in his operation; and the imperfect summing-up chiefly referred to points where I had departed not from other operations, but from his. I borrowed freely from several methods, and I said so. The first part of the plan I followed resembles Mr. Wood's in having one umbilical and two groin flaps; it differs in the shape of the flaps, their size, and the manner in which they were secured. The second, most difficult, and, in my opinion, the most important part of the operation, is entirely different from Mr. Wood's second operation. At one operation, and by different methods, I did what Mr. Wood does not attempt in less than two, and usually requires more to complete. That so much success, in the face of most unpromising circumstances, has attended my first efforts is due, not to my being able to operate with one tithe of the skill of Mr. Wood, but to the plan of the operation.

Though the plastic method of treating this deformity has hitherto proved the most successful, I think Mr. Wood is too severe in his condemnation of the procedures of Simon and Holmes by diverting the course of the urine into the rectum. The most perfect success of the plastic method can never give more than a very small bladder with incomplete control over its contents; and, until some restraining power as strong as the rectus muscle can be laid in front of it, the bladder will bulge forwards according to its size and dilatibility, and be correspondingly an encumbrance and deformity. If either of the above methods succeeded, and the extroverted mucous membrane could be covered with skin, and the epispadias cured, the result would probably surpass any that had followed the plastic method. In this belief, I intend to treat any case that may in future come under my care after some such method as that of Simon or Holmes.

A YEAR'S EXPERIENCE OF GALL-STONES.*

By THOMAS COLE, M.D.Lond., etc.,
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As hepatic diseases are seldom alluded to at our meetings, it has occurred to me that it would be not altogether unprofitable to string together a few results of my experience during the past year in the matter of gall-stones; and I do so more from a desire to excite discussion on the subject, and thereby to benefit by the remarks of others, than from the hope of being able to impart any knowledge of a special character.

Observation would lead me to believe that gall-stones are far more common than they are generally supposed to be by our profession; and I would add that they are often also very much more dangerous. Many cases that are diagnosed as gastric spasm, flatulence, or colic, are, no doubt, due to the escape of gall-stones from their habitat into the intestines. For instance, a lady consulted me recently for sudden and severe attacks of pain in the epigastrium, and radiating thence all over the abdomen, with sickness. They lasted for from a few minutes to an hour or two. She had usually been treated for cramp in the stomach, and was surprised when I told her she was suffering from gall-stones. My opinion was shortly confirmed by my finding at least twenty calculi after one of her seizures, which lasted only about an hour—too short a time, of course, for the development of any jaundice or other symptoms of obstruction.

Only last week, I asserted with some confidence that a lady sixty-eight years old was passing a stone. She had severe pain in the hepatic region, with vomiting, loss of appetite, and constipation; and had had many similar attacks. Her sister, who has suffered from gall-stones from childhood, was most sceptical as to the nature of the illness, because the pain did not seem to be severe enough, and no jaundice had supervened. The next day, I was able to produce, very triumphantly, a small stone, in shape exactly like a flint implement of the prehistoric period; and I found two more a few days afterwards. I do not know anything that inspires confidence more than the fulfilment of a prophecy like this, which you can prove so easily to a patient, and just at a time, too, when his gratitude for relief from the pain his enemy has caused has not vanished from his heart. By way of parenthesis, I would express the belief that gall-stones are not particularly uncommon in the young. I have lately attended a lad aged 16, who expelled twenty-seven stones in a week; and I shall allude further on to a case which proved fatal in a man aged only 24.

It is interesting to note the occurrence of gall-stones in two members of a family, in one of whom the tendency to the disease had been so strong as to have existed from childhood. The worst attack this lady ever had was during last year, and it lasted about seven weeks. Vomiting and intense paroxysms of pain tortured her more or less the whole time; the deepest jaundice prevailed; and there was the most intense prostration. At last, the mouse that had troubled the mountain came forth, and a tiny one it was—not bigger than a bean; and she had passed hundreds in her life, so that the ducts should have been fairly patulous. But I think the passage of the stone was probably hindered by catarrh of the ducts, from irritation produced by the presence of the stone, which was very rough and sharp. The patient was so constantly sick as to preclude any use of emetics. It was somewhat curious that the exciting cause of this attack was the vomiting attendant upon the progress of an uric acid calculus from the left kidney. The patient's being subject to both uric acid and hepatic calculi would seem to favour the opinion, that gout and biliary stones are closely related as effects of one common cause.

Another of my patients has passed quantities of uric acid calculi, and has suffered too from gall-stones, and is now the subject of granular kidney. She is also a female. Two or three patients also have been the victims of gall-stones and regular gout.

Rather a rare occurrence has happened to two of my patients, both females—that of vomiting gall-stones. No doubt they were squeezed, by the action of the abdominal muscles in vomiting, back from the duodenum into the stomach, just as bile regurgitates from the same cause when people are sick, making them think they are bilious, whatever that term may mean. According to works on liver-diseases, it is extremely unusual for gall-stones to be ejected from the stomach, unless, they have ulcerated their way through directly from the gall-bladder into the stomach. This obviously was not the case in the two instances I have mentioned.

I will now briefly relate a case in which five gall-stones about the size of peas were impacted in the ducts for six weeks. The patient,

* Read before the Bath and Bristol Branch.