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# HYDRAMNIOS:

AND THE

## SOURCE OF THE LIQUOR AMNII.

BY

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## HYDRAMNIOS: AND THE SOURCE OF THE LIQUOR AMNII.

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THE interesting researches of Professor Gusserow, ten years ago, into the intrauterine secretion of the foetus gave a great impulse to the re-investigation of the source or sources from which the liquor amnii is derived. This is no new subject of debate. An extended account of the various views regarding it was given by Martin Schurig in his *Embryologia Historico-medica* in 1732. Ere that date it had already been discussed whether the fluid was of maternal or foetal origin, and, in the latter case, whether it was produced by the kidneys, the skin, the brain, the eyes, the mouth, or the mammæ. There is even a premonition of the vasa propria of Jungbluth in the sentence quoted from Johann de Muralt, "Liquor in amnio membrana contentus eo devenit per lymphæ ductus gelatina obsessos ad funiculum umbilicalem evidentes, tum etiam per arterias in placentam terminantes." And the very plausible suggestion of Fehling that the liquor comes from the cord is clearly anticipated when he says, "Depingit Bidloo in funiculo umbilicali plures parvos ductus ope microscopii detectos, quos dicit continere succum nutritivum, et quorum proinde (si revera existant) usus est, advehere materiam nutritivam a matre versus foetum, aut saltem in amnii capacitatem." The sum of all the discussion pretty much amounts to what is expressed in a sentence quoted from Marguerite du Tertre, who, in answering the question, "D'où proviennent les eaux du amnios," replies, "Les auteurs sont partagés là-dessus. Les uns pensent, qu'elles proviennent des urines et sueurs de l'enfant, et d'autres croient, que c'est de la sérosité du sang; mais enfin c'est un grand effet de la Providence, puis qu'elles causent tant de bien."

The chief point of debate in recent times has been as to the share taken by the foetal kidneys in producing the liquor amnii. According to Gusserow and his followers, this fluid is in the latter months of gestation almost entirely derived from the



urine of the foetus, which is supposed to be secreted regularly by the kidneys and evacuated from time to time from the bladder. Wiener even goes so far as to aver that, whilst at the very first the liquor amnii is derived from the skin of the embryo, soon after the fourth week the Wolfian bodies begin to furnish a fluid which escapes into the amniotic cavity; this is thus kept distended, first by the activity of the primitive kidneys and then by the more fully developed organ.

Now I confess at once to considerable sympathy with the old writer who asks, "*Si foetus brutorum ea sunt munditie, ut lotium hospitio emittant, cur foetum humanum adeo sordidum habeamus, ut existimemus, eum proprium suum domicilium lotio aspergere, et, quod reddidit, ferculum deinde resorbere?*" Of course we don't now need to shudder at the idea of it feeding on its own vesical evacuation, as no one now supposes that it is nourished by the liquor amnii; but the question is, Are we compelled to believe that the foetus always lies bathed in its own urine?

The proof of the renal origin of the liquor is sought, (1) in the presence of chemical matters, such as indigo, introduced into the foetus indirectly through the mother's blood, or directly by hypodermic injection into its own body, and secreted by the kidneys; (2) in cases where the urinary bladder of the foetus has been found distended; (3), in the hydronephroses which result from occlusion of the urinary outlets.

1. As to the 1st, I can only say, that after reading the papers descriptive of the experiments of Gusserow, Wiener, and others, I cannot see that more is proved than that the renal function of the foetus is sometimes called into activity, and that the distended bladder may easily be emptied into the amniotic sac. Wiener says, "There is no fact which compels us to doubt the regular secretion of the foetal kidneys and the occasional evacuation of the urine into the liquor amnii;" but what we want are the facts which will compel us to believe in more than an occasional secretion and accidental evacuation of foetal urine. There is abundant evidence from experiment and observation to show that the foetal kidneys can and do sometimes secrete actively enough. What is wanting is evidence to show that there is a necessity for continuous renal activity more than there is for hepatic or pulmonary activity in the foetus in utero.

2. This leads me to notice the second ground on which the theory of the regular renal activity of the intra-uterine foetus is sustained, viz., the observation that the foetal bladder has sometimes been found distended with urine. Such a case is related by Wiener of a woman who died of a burst varicose vein when far advanced in pregnancy, and in whose uterus the foetus was found to have the bladder tensely filled with urine. The case admirably helps to prove the point which Wiener is then affirming in his



polemic with Ahlfeld as to the influence of intra-uterine pressure on the foetal secretion and excretion; but it no way proves habitual renal activity in ordinary conditions. It simply shows that when depuration of the foetal blood is suspended in the placenta in consequence of maternal hæmorrhage, the functional activity of the foetal kidneys is at once called into play. Where the interruption to the placental circulation sets in more rudely, we constantly see a corresponding effort at functional activity of the foetal lungs—effort, however, that is futile, because the foetus is shut up in its water-filled sac.

3. The group of cases where the urinary ducts are atresic at some point and dilated above has also been called into court in support of the theory of the regular activity of the foetal kidneys. But if they prove anything, they prove that regular renal action is unnecessary in the intra-uterine foetus. One of the most interesting cases that has recently been recorded we owe to Professor Rindfleisch. A six-weeks-old child, which had from birth suffered from difficulty in the evacuation of the bladder, died of pleural effusion. The difficulty was found to have been due to hypertrophy of the caput gallinaginis, which had led to vesical hypertrophy and double hydronephrosis. This is to me the more interesting, that some months ago I met with a parallel case. At the post-mortem examination, which Dr D. B. Hart and I made hurriedly by gas-light, we did not determine the exact seat of obstruction further than that it was below the neck of the bladder. The child appeared healthy at birth and was well for three weeks, when it began to feed less willingly and to suffer from sickness. The nurse stated that though the infant regularly wetted its cloths she had never seen it pass water in a stream, only in drops. The lower limbs and abdomen became anasarcous, the peritoneum ascitic, and the infant died rather suddenly, within five weeks of its birth, with double pleural effusion. The urinary organs were found as in Rindfleisch's case. That distinguished pathologist supposes that the distention of the ureters and kidneys had begun in utero, and that such cases afford a proof of intra-uterine renal secretion. But it seems to me that we must rather suppose that in utero the renal activity had not been called out, and that it was only after the child was born that the function of the kidneys was established, leading first to hypertrophy of the bladder, then, secondarily, to hydronephrosis, and finally to a fatal issue from the serous effusions resulting from the impediment to renal action. So long as the child was in the uterus, having its blood depurated in the placenta, the urethral obstruction caused no disturbance. Within five or six weeks of the day when the renal activity became necessary for blood-depuration, it led to the death of the infant. Does that not mean that during the six weeks antecedent to birth the rôle of the kidneys was entirely passive, so that a strictured urethra was a matter of indifference, and the healthy development of the foetus



was in all respects unmodified, and that immediately after birth the renal function was called into activity, and the urethral interference with it at once began to tell on the health of the child, and within six weeks caused its death?

Whilst it seems to me, therefore, that we are not warranted in looking to the kidneys as the main source of supply of the liquor amnii, even during the later months of gestation, I by no means deny the occasional and accidental evacuation of the bladder in the amniotic sac, and I am not prepared to give a definite opinion as to the ordinary source of the amniotic liquid. I think we are wisest to acknowledge our ignorance.

Perhaps some light may come to us by a more careful observation and analysis of cases of hydramnios. The Transactions of our Society bear ample testimony to the tendency, to which I drew its attention some twenty years ago, of women giving birth to anencephalic children to be affected with excess of the liquor amnii. It was curiously illustrated in the cases of two patients who were confined in the Maternity within the same twenty-four hours, and whose histories are fully recorded in the last Quarterly Report. These two cases had this in common, that anencephalic foetuses were born, and the birth was attended with the escape of an excessive quantity of liquor amnii.

I am here diverted from the main current of this communication to call attention to the differences between these two cases, as they illustrate a cause for the excessive accumulation of the amniotic fluid which has not been specially registered, so far as I have noticed, among the causes of hydramnios. In the first case we have to do with a multipara in her eighth pregnancy; in the second the patient was primiparous. In the first the foetus was simply anencephalic; in the second the spinal column was at the same time bifid in all its extent. If the excess of liquor amnii be due (as in such cases I have tried to show it to be) to the secretion from this exposed serous surface, the excess might have been expected to be greatest in the case where the extensive bifidity of the spine gave an additional area of secretion. The excess, however, was most marked in the first of the cases. In that patient it was such that she overpassed the normal duration of pregnancy. She came into the Maternity about the expected date of her confinement, with symptoms of labour which passed off. The uterus was so overdistended that though contractions set in from time to time which seemed to indicate the onset of labour, they always subsided again until the foetus died. The membranes decayed and burst, and allowed of the escape of some of the liquid. It was only after the waters had some time escaped that effective uterine effort could take place. Now I suggest that the greater excess of liquor amnii in the first than in the second case is to be explained by the greater laxity of the uterine walls of a multipara. The well-known statistics of M'Clintock give



only five out of thirty-three cases in primiparous patients; of the twenty-eight multiparous cases, eight were second labours, one a twelfth, the rest intermediate. Whatever the source of the liquor amnii may be, the degree of tonicity and tension of the muscular walls of the uterus must have a large influence in determining the amount that is allowed to accumulate; and any loss of tonicity in these muscular walls will favour the occurrence of hydramnios.

Reverting now to the possible sources of the liquor amnii, it had occurred to me that in these cases one should find in the condition of the kidneys some evidence of unusual functional activity if their secretion were the usual source of supply. By some mishap both of these foetuses had been destroyed without the special examination being made. But soon afterwards Dr Alexander sent me, for class-demonstration, another anencephalic foetus with bifid spine, the birth of which also had been attended with the escape of an unusual flood of waters. I show you now the urinary organs. The bladder and ureters are empty, but perfectly developed, though no urine has passed through them. The kidneys, right and left, are small, and have undergone cystic degeneration, evidently from an early period. Here there can be no possibility of any participation of the kidneys in the production of the liquor amnii. The liquor was unusually abundant; but the kidneys were functionally useless. It will be of some importance in such cases to collect and analyze the liquid, so as to compare it with the analysis in normal cases; but unless there be shown to be a peculiarity hitherto unsuspected in the nature of the fluid from a hydramniotic ovum, we must conclude that the secretion and accumulation of amniotic fluid can go on quite independently of the functional activity of the foetal kidneys.

Besides the systematic works of Tarnier and Chantreuil, Spiegelberg, Schroeder, Playfair, Lusk, I have had in view the following contributions:—

AHLFELD.—Beschreibung eines sehr kleinen menschlichen Eies, *Archiv f. Gyn.*, Bd. xiii. S. 241. Ueber einen Monopus mit vollständigem Mangel der äusseren Genitalien und des Afters, *Ibid.*, Bd. xiv. S. 276.

FEHLING.—Beiträge zur Physiologie des placentaren Stoffverkehrs, *Archiv f. Gyn.*, Bd. xi. S. 523. Also, Ueber die physiologische Bedeutung des Fruchtwassers, *Ibid.*, Bd. xiv. S. 221.

GUSSEROW.—Zur Lehre vom Stoffwechsel des Foetus, *Archiv f. Gyn.*, Bd. iii. S. 241. Also, Zur Lehre vom Stoffaustausch zwischen Mutter und Frucht, *Ibid.*, Bd. xiii. S. 56.

JUNGBLUTH.—Beitr. z. Lehre vom Fruchtwasser, etc., D. i., Bonn, 1869, *Virchow's Archiv*, B. 48, S. 523. And *Archiv f. Gyn.*, B. iv. S. 554.

PROCHOWNICK.—Beiträge z. Lehre vom Fruchtwasser und seiner Entstehung, *Archiv f. Gyn.*, B. xi. S. 304 and 561.



RINDFLEISCH.—Eine Vergrößerung des Caput gallinaginis als Ursache congenitaler Ischurie und Hydronephrose, *Virchow's Archiv*, Bd. lxxxii. S. 521.

WIENER.—Ueber die Herkunft des Fruchtwassers, *Archiv f. Gyn.*, Bd. xvii. Hft. i. S. 24.

ZUNTZ.—Ueber die Quelle und Bedeutung des Fruchtwassers. (Vorläufige Mittheilung) *Pflüger's Archiv*, B. xvi. S. 548.





