CONGENITAL STENOSIS OF THE POSTERIOR URETHRA WITH RESULTANT CONGENITAL BILATERAL HYDRONEPHROSIS WITH DILATATION OF THE URETERS AND DILATATION AND HYPERTROPHY OF THE URINARY BLADDER AND POSTERIOR URETHRA.

- by -

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and unless an autopsy were performed such cases would not be diagnosed. The case treated in this article is considered as congenital in origin, but not in any sense of the word as developmental, though this view is not held by all writers on the subject.

Other forms of Congenital Hydronephrosis occur and may be due to (A) anatomical anomalies such as:-

1. Kinking of ureters.
2. Ureters of excessive length.
3. Presence of aberrant vessels causing a hindrance to the outflow of urine.
4. Intra-uterine inflammatory conditions of the ureters. (Brown & Johnson)
5. Pressure on the ureters from adherent structures or neoplasms or swollen glands.
6. Congenital narrowing of the ureters especially at their vesical orifices.

In these cases, however, the hydronephrosis is almost always unilateral.

or (B) developmental anomalies as:-

1. Tight prepuce.
2. Imperfect development of the terminal urethra.

or (C) Presence of foreign bodies in any part of the urinary tract from the upper end of the ureter to the meatus urinarius.

All cases coming under the foregoing heads are

excluded from this work and only that type is considered which is due to congenital obstruction in the posterior urethra at or near the junction of the prostatic with the membranous urethra.

Many of the cases of hydronephrosis due to obstruction in the posterior urethra, heretofore described, are said to have been due to developmental folds or valves either level with the apex of the verumontanum or a little above or below it. Now in my case, in which there is marked hydronephrosis and marked dilatation and hypertrophy of the bladder, no valves are present and the normally existing folds are in no way hypertrophied. Some cases taken from the literature make no reference to the presence of folds or valves but all agree in describing the presence of hypertrophy of the muscles of the bladder and of the muscles surrounding the upper part of the urethra, and it is to this muscle hypertrophy, - a common factor in all the described cases - that one turns in seeking to arrive at the aetiology of the condition, namely that of Hydronephrosis with hydroureters and dilatation and hypertrophy of the bladder.

The part played by the two important factors, namely:-

(A) Presence of folds or valves

(B) Muscle hypertrophy

in the production of these phenomena will be discussed later (with special reference to the case recorded here for the first time), in order to determine, if possible, the aetiological significance of each. Amongst the questions that arise the following require consideration:-

1. The aetiological significance, if any, of the so called valves.

2. Whether or not the valves when present are the cause or are they themselves acquired in consequence of some pre-existing condition?

3. If hypertrophy of muscle be the cause, is the hypertrophy a simple hyperplasia or is it the result of stimulation either of the muscle directly or through its nerve supply?

4. If the stimulation be through the nerves does it act directly on the muscle or on its blood vessels?

5. To what extent is the autonomic nerve supply responsible for the irregular and spasmodic contractions of muscle which may ultimately bring about hypertrophy?

This article is presented under the following heads:-

(A) History of author's case.

(B) Different theories brought forward as to the aetiology of the condition.

(C) Anatomical and embryological points necessary to the discussion.

(D) Aetiology.

(E) Discussion of the various theories re the Aetiology.

(F) Conclusions.

(G) Cases from literature.

KEY TO SECTIONS.

HISTORY OF CASE 1. BABY K.

Parental History.

Father a young healthy labourer.

Mother aet. 27 years, perfectly healthy, primipara.
Wassermann of both parents was negative.
The period of gestation was normal and labour was of normal duration.
Presentation Breech. (L. S. A.)

The first sign of any abnormality was noticed when the child was being delivered; it was seen to have rather a large abdomen. There was some delay with the after coming head and the child was still-born. Death from asphyxia was recorded.

Duration of labour - 10 hours.

Autopsy:-

The body was that of a full time male child, well nourished. Weight 3125 grammes. Length 50 c.m.
At first examination the penis seemed defective; it was represented externally as a mere papilla with the meatus urinarius opening at its apex. But on further examination this was found to be due to slow growth of the prepuce and skin covering the penis. The meatus

urinarius was on a level with the pubis, and clear urine could be squeezed from it. The scrotum was fully developed but empty of both testicles. Immediately above the penis was a circular scar puckered on the surface and slightly depressed below the level of the surrounding skin. There were no other signs of malformation. The abdomen was somewhat distended and wider than normal from side to side, the anterior abdominal wall was uneven and nodular in contour. (See Plate I) A firm mass could be felt extending from the pubis to the umbilicus, the lower border of which extended into the pelvis and could not be explored. This oval mass of about 2" diameter could be moved with the Anterior abdominal wall.

Medial Section:-

On opening the abdomen in the middle line, a greatly distended bladder was found, reaching from the pubic bones to the umbilicus, to which it was firmly attached by a short urachus which was not patent. The bladder was very firm, almost solid in consistence, but it contained about 1½ oz. of urine. The testes were lying near the lower poles of the kidneys on their anterior surfaces and suspended from them by the mesorchium and also adherent to the anterior abdominal wall.

Before the abdominal contents were touched, the greatly distended ureters which resembled in appearance coils of large intestine presented conspicuously were seen occupying the lower part of the abdominal cavity and displacing the colon upwards.

The Kidneys also were both visible at this stage in the dissection. Both were lobulated, distorted in shape and enlarged. The right kidney was displaced upwards. The appearance at this stage is well shown in Plate II. The fluid in the bladder was drawn off for analysis. The kidneys, ureters, bladder and penis were removed intact and the specimen hardened in formalin.

Left Kidney:-

Measurements:- a little larger than normal (See table of comparisons later); it was lobulated and when cut into, was found to contain about 5cc. of fluid. The calices of the kidney were flattened and there were several cystic cavities in the substance of the kidney with great destruction of kidney tissue, the cortex as well as the medulla being involved.

Right Kidney:-

This was very much increased in size (See table of comparisons later). The lower pole was distended to the size of a tennis ball and consisted of a large cyst,

the covering of which appeared similar to a fibrous sac, and on examination was found to consist of flattened cortex, capsule and peritoneal covering. The fluid contents amounted to 10 cc. The upper pole contained some small cysts, the kidney tissue was compressed but contained more or less secretory substance. The large cyst at the lower pole opened out into the distended pelvis of the kidney. The Right Kidney was more affected than the left; contrary to the general rule as stated by Young. (Plate III.)

Measurement of Kidneys contrasted with normal measurements as given by Dr. Freudenstein.

Circumference in millimetres.

		The largest.		The smallest.	
		r.	l.	r.	l.
Normal Kidneys.	1.	133	135	62	61
	2.	123	125	52	53
	3.	119	125	56	62
	4.	117	119	59	60
Average		123	126	57.2	59
Author's Case		243	137	133	90
Increase		120	11	75.8	31

Left Ureter:-

Length 24.0 c.m; average width 2.0 c.m. Thickness of wall 1 mm. This ureter was distended throughout its length but to a lesser degree than the right. It formed a convoluted tube and at the convexities of the convolutions the wall of the ureter bulged out, forming wide-mouthed pockets.

Right Ureter:-

Length 26.0 cm. Width 2.5 cm. Thickness of wall 1 mm. It was greatly distended, being considerably larger than the normal colon at birth, and formed a convoluted tube similar to the left. The upper end of the ureter was attached to the upper or more healthy part of the kidney, but the pelvis opened out into the distended lower pole and the dilated ureter stretched from the kidney upwards, above and in front of the renal vessels, thus half encircling them.

The Bladder:-

Dimensions:- from apex to base 82.5 mm. Breadth at widest part 50 mm. Thickness unopened 35 mm. Thickness of bladder wall at base 10 mm., at apex 7.5 mm. On opening the bladder by a carefully selected medial incision the bladder wall was found to be uniformly thickened. Its consistence resembled that of a uterus.

The thickening extended down the penis and involved the greater part of the prostatic urethra. The inner surface of the bladder was trabeculated and folds could be seen extending from the bladder along the posterior wall of the urethra as longitudinal muscle bands. The Mucous membrane appeared to be healthy. (See Plate IV.)

The urethral openings were both patent and somewhat puckered. The internal sphincter of the bladder was dilated to 4 mm.

On attempting to pass a probe through the urethra from the meatus into the bladder some obstruction was met with at the posterior urethra, this was occasioned by the somewhat raised verumontanum. On attempting to introduce the probe from the bladder down the urethra it met with obstruction at the lower end of the prostatic portion; it was however found that when the point of the instrument was kept close to the anterior wall its passage was quite easily accomplished. On looking through the distended internal sphincter, the posterior urethra was seen to be widely dilated and to end in a pocket. This pocket was formed by the posterior wall of the prostatic urethra, and when the probe was inserted into the urethra from the bladder end it was held up in this blind pocket. (See Plate IV.)

Measurements of normal bladder in New Born as compared with Author's case, Dr. Freudenstein's figures being taken for the normal measurements in millimetres.

		Dr.Freudenstein.				Author's.	
		1.	2.	3.	Average		Enlargement
A)	Circumference of bladder from bladder neck to bladder neck	65	82	71	72.66	153	80.34
B)	Circumference horizontal direction at broadest.	42	41	43	42	135	93
	Distance between the line joining the opening of the two ureters from (a) Urachus						
(C)		24	29	32	28.3	55	26.7
(D)	(b) From lower edge of neck of bladder	8	9	6	7.66	27.5	19.84
(E)	Distance between the openings of ureters.	16	14	14	14.61	27.25	12.64

Penis.

The medial incision in the bladder was now continued along the anterior or dorsal surface of the penis to the meatus urinarius. The widely dilated prostatic urethra already described was brought into view, and the verumontanum situated on the crest in front of the pocket was seen to be enlarged (Plate IV.) The utricle was somewhat dilated. From the anterior end of the verumontanum, two projections passed forwards along the urethra, and, diverging from each other as they passed downwards became lost in the lateral walls of the urethra near the junction of the prostatic and membranous parts. These two projections showed no sign of hypertrophy and their greatest height near the verumontanum was 1 mm. No other folds or valves could be located in the urethra. Twelve normal specimens of full time male foetuses were examined (Plate V.) and it was found that the extent of development of these folds was variable. Even from the distorted posterior urethra in Plate IV. the site of the verumontanum can be seen to occupy the junction between the posterior two-thirds and the anterior one-third of the prostatic urethra. (This can be seen better in the 2 plates of normal urethrae). (Plates V & VI.)

The prostate was somewhat enlarged but the enlargement

was due to the inordinate development of muscle surrounding the prostate. The thickness of the muscle wall at this part of the urethra was 3.3 mm. while the normal thickness for the newly born is about
It was found too that on examining a number of normal prostates from full time foetuses that the disparity in size between the newly born and the adult normal prostate is not nearly so great as is believed. This view is confirmed by Dr. E.B. Jamieson. The great difference that does exist lies in the relatively smaller quantity of glandular tissue in the foetus.

The remaining part of the penile urethra was norma. The condition already recorded of the external appearance of the penis (See Plate I.) was due to the contraction of the skin over the penis. Had the child lived, no doubt the organ would have developed normally.

The posterior view of the bladder showed an unusual feature in the presence of a greatly distended utriculus prostaticus (See Plate VII.) A still more exaggerated example was found in Tolmatschew's case (See Plate

In view of the fact that one of the supposed causes of this condition of Bilateral Congenital Hydronephrosis is the over development of the "uterus masculinus", it is worthy of note that when over-development of this part

does occur, it occurs in the direction outwards from the urethra (See Plate VIII. Keith)

The Trigone formed a triangle, the base of which, lying between the ureteral openings, measured 27.5 mm. and the sides 29.5 mm.

Brain:-	wgt. 400 grms.	No haemorrhages.
Thymus:-	wgt. 15 grms.	Subcapsular haemorrhage due to asphyxia.
Thyroid:-	wgt. normal.	
Lungs Rt:-	wgt. 33 grms.	Subplural haemorrhage very well marked, unaerated.
Lt:-	wgt. 27 grms.	ditto.
Heart & Blood vessels.	Heart wgt. 29 grms.	Subpericardial haemorrhage well marked. The right heart was somewhat dilated and the wall of both ventricles appeared to be about equal in thickness. There was no abnormality in the valves or vessels.
Liver:-	wgt. 114 grms.	Congested, otherwise normal.
Spleen:-	wgt. 10 grms.	Normal.
Pancreas:-		Normal.
Suprarenals:-		Normal.
Scrotum:-	Fully developed, but the testes which were well developed lay within the abdomen close to the lower poles of the kidneys. (cryptorchism).	

The vas deferens were tortuous and a little dilated.

Seminal vesicles appeared as a pouch measuring 10 mm. and 12 mm. respectively in diameter.

Sternum Epiphyses. 1 in manubrium.

5 in the body.

Umbilical cord:- length 92 cm.

No abnormalities except somewhat excessive length and thinness in parts.

Placenta:- wgt. 570 grms.

Did not seem enlarged or thickened.

Very vascular.

No abnormalities.

Examination of urine:- Amount of fluid taken from Bladder 43.2 cc. and from both kidneys 15 cc.

Colour:- Pale straw.

Faint odour.

Alkaline.

Specific gravity 1012.

Urea - trace.

Albumen present.

Sugar - nil.

MICROSCOPIC FINDINGS.

Ureters:-

The lumen was greatly increased in diameter, the walls were correspondingly thickened. All coats shared in this thickening but chiefly the muscular coat. The mucous coat or lining was thickened but it was intact and there was little or no cornification of the epithelial cells such as one sees in hydroureters due to inflammatory conditions. The serous coat was thickened and contained an excess of elastic fibrous tissue. The muscle layer was greatly thickened and the muscle bands and fibres were separated by fibrous tissue. The blood vessels appeared healthy and all the coats were freely supplied. (Plate IX.)

Kidneys:-

The capsules were thickened. The Right kidney showed more extensive destruction of the parenchyma than the left. A section including the whole thickness of the kidney showed marked compression of all the structures. (See Plate X.) The cortex was very narrow and showed great diminution in the number of glomeruli and convoluted tubules. The lining of these tubules and glomeruli showed desquamation of epithelium. The medulla over the

greater part of the kidney could be made out. Sections of some parts of it showed compressed collecting tubules surrounded by connective tissue and instead of being straight tubules their course was quite distorted. Some sections of the cortex and medulla showed complete absence of parenchymatous tissue, no glomeruli and no convoluted or collecting tubules being present, their places being taken by fibrous tissue.

At best the pyramids and renal tissue showed marked atrophy, this probably being due to the constant pressure exerted by the dammed up urine.

Blood vessels few in number but the coats were not thickened.

Bladder wall:-

The wall was greatly thickened with marked hypertrophy of the muscular layers. The muscle bundles of both the circular and longitudinal coats were large and were separated by fibrous tissue. The mucous membrane proliferation of its cells with some scattered mononuclear cells. The serous coat was also increased in thickness and consisted chiefly of fibrous tissue.

Urethra:-

A section through the prostatic urethra and prostate taken longitudinally (See Plate XI.)showed a marked

diminution from the normal amount of glandular tissue, the tubules of which showed signs of pressure atrophy. These tubules were lined with columnar celled epithelium some of which were in the transitional stage - becoming cubical cells.

There was marked increase in muscle tissue, the muscle bands were separated by a variable amount of fibrous tissue with but few elastic fibre elements. The circular fibres reached as far as the membranous urethra.

The lining of the urethra was made up of stratified pavement epithelium which appeared quite healthy.

A series of cross sections were made through the folds that project from the verumontanum, showing their structure. (Plates XII a. XII b. XII c.)

The folds were covered with epithelium similar to that lining the rest of the urethra, namely cylindrical epithelium. The main body of these folds consisted of fibrous tissue. These sections were stained with van Gieson and they were shown to contain no muscle tissue. There was no cell infiltration suggestive of trauma or inflammation.

The anterior part of the urethra was quite normal.

Lungs:-

Unaerated. Some increase of interstitial tissue in

the alveolar walls, the capillaries of which were congested. In some of the vessels, the coats, especially the Tunica intima and the Tunica adventitia, were thickened, and occasionally a vessel was seen whose lumen was completely obliterated. But this change in the vessels was not so pronounced as to be assigned to Syphilis. The alveoli contained a little fluid, probably liquor amnii. There was no desquamation of the endothelial linings of the alveoli.

Thymus:-

Both cortex and medulla were well defined and the corpuscles of Hanal were normal in size and appearance.

Heart-muscle:-

Normal.

Placenta:-

The villi showed a quite abnormal amount of vascularity. They were occupied by dilated capillaries that filled the entire core of the villus and had no supporting stroma, the walls of adjacent capillaries thus being in contact. Very frequently the entire villus was occupied by one large dilated capillary. The entire absence of any thickening of the walls of these vessels was remarkable. Here the vessels in the large villous stems seemed to be nothing more than sinuses in the

villous stroma lined by endothelium. In no case was a vessel found showing the normal obliterating endarteritis of the placental vessel. (The result of this dilatation of the foetal vessels in the villi was to enlarge the individual villi so that the spaces between them were diminished in extent and the maternal circulation must therefore have been diminished in amount).

The Cord:-

Was normal microscopically.

Wharton's jelly appeared normal in amount and appearance. The vessels of the cord showed a normal amount of thickening of their coats.

Thyroid:-

Showed more fibrosis than is usually met with but not sufficient to classify it as syphilitic.

Liver:-

No cirrhosis, but there was much congestion.

Marked haemopoiesis, the new cells formed being almost entirely lymphocytes with a fair number of myelocytes. There were no nucleated red blood corpuscles.

Spleen:-

Normal.

Pancreas:-

Normal.

DIFFERENT THEORIES AS TO THE AETIOLOGY.

The case just described belongs to a type of which the aetiology has not yet been settled, but different theories have been put forward by different investigators and each has its followers. These theories submit that:-

1. The condition is due to an obstruction caused by the simple overgrowth of already existing folds. This theory was put forward by Tolmatschew and is followed by Lindemann, Wilckens, Bednar, Schlagenhaufer, Englische, Bonnet and Knox and Sprunt.
2. The condition is due to an obstruction in the posterior urethra at a point where that portion of the penis which develops from the cloaca and that part which develops from the urogenital sinus meet and the obstruction takes the form of a membrane that has persisted similar to the condition of imperforate anus. Bazy brought forward this view and his supporters include Lederer, G.S. Thompson, Posner, Heinecke and Commandateur.
3. The condition is due to an obstruction in the posterior urethra at a point where the Wolffian and Muellerian ducts join the penis and that it is caused by an anomalous development of these two

structures. This theory is followed by Lowsley and others.

4. It is due to congenital folds or valves which may exist in almost any part of the posterior urethra. This view has for its supporters Watson and Young, Frontz and Baldwin.

5. The condition is due to a hypertrophy of muscle caused by a "disturbance of the normal co-ordination, a sort of intra-uterine 'developmental neurosis' ". This theory was first suggested by Thomson in 1902.

ANATOMICAL AND EMBRYOLOGICAL POINTS NECESSARY TO THE DISCUSSION.

Before discussing the various theories it may be advantageous to consider certain points in developmental anatomy. It is known that the urethra has a dual origin but the site of junction of the two parts is still a matter of controversy. The problem is of some importance when dealing with the aetiology of this condition for, if it is shown that the folds occur at the site of union, then it may be fairly considered that they are remnants of a pre-existing membrane.

According to one author (Cunningham, Text Book of Anatomy, p.9, 1203) the upper part of the prostatic urethra has an origin similar to that of the bladder and is derived from the upper portion of the urino-genital subdivision of the cloaca. The lower prostatic and membranous parts are formed from the urino-genital canal of the embryo. According to this view the line of demarcation would be the point of entrane to the Wolffian and Muellerian ducts, namely the Sinus Pocularis. Bazy in accounting for the obstruction in the posterior urethra says that the cloacal membrane forms the line of demarcation between the two parts of different origin, and holds that the whole of the part above this

membrane is of Entodermic origin,
while that below the membrane (e.g. the membranous and penile parts of the urethra) is derived from the Ectoderm. There seems some evidence in support of this view, for in the embryo the urinogenitary sinus reaches to the point in the early cloaca at which the urinary and seminal ducts open. In the embryo these openings enter at about the same point. Thus he takes it that the point of junction is situated about the entrance of the Wolffian duct, (which in the male constitutes the Vas deferens).

According to Heisler (Embryology page 240), the bladder and the entire female urethra (but in the male only the prostatic portion) result from metamorphosis of the intra-embryonic part of the allantois and are therefore to be regarded as of entodermic origin. That is the part of the allantois contained within the body of the embryo produces three structures:-

First the urachus - an atrophic cord.

Second the urinary bladder.

Third the first part of the urethra in the male and the entire urethra in the female.

According to Keith, the bladder, except that part which forms the trigone, is formed from the portion of the allantois that remains within the body of the embryo. The orifices of the Wolffian and Mullerian ducts migrate downwards leaving the upper part of the urinogenital sinus

to form the trigone of the bladder with its insertions of the ureters and the supra-genital part of the urethra. (Plate XIII.)

"The Mullerian ducts open on to the cloaca of the embryo side by side between and below the openings of the Wolffian ducts. The passage which serves as a common channel for the bladder, Mullerian and Wolffian ducts, is the Urogenital sinus."

"In the male the early foetal form is retained and the urogenital sinus becomes that part of the urethra between the sinus pocularis and the fossa navicularis. The female urethra corresponds to the prostatic part above the opening of the sinus pocularis of the male urethra."

The conclusion which the above views seem to indicate is that the point of union between the parts of the urethra of different origin is at a level with the sinus pocularis so that if any remnant of membrane be left during development it should be found in this situation.

MUSCULATURE OF BLADDER AND URETHRA.

From Keith, quoting F.W. Jones, The circular muscular coat of the urethra is continuous above with the sphincter

and circular coat of the bladder, and below it becomes continuous with the striated fibres (constrictor urethrae) surrounding the membranous urethra. These latter, however, are not developed from the musculature of the urogenital sinus, but from the sphincter cloacae. Besides the muscular coat of the urethra, the musculature of the urogenital sinus gives rise to the muscular elements on the prostate.

From Cunningham. The nerve supply of this part is derived from the prostatic plexus, which is placed on either side of the prostatic gland and in addition to supplying its substance and the prostatic urethra it sends off shoots to the neck of the bladder and to the vesicula seminalis. It is continued forward on each side to form the cavernous plexuses of the penis. Bundles of nerves pierce the layers of the triangular ligament and after supplying the membranous urethra at the neck of the bladder, branches are given off which enter and supply the corpus cavernosum. It is to be noted that the uterine and vaginal plexuses in the female correspond to the prostatic plexus in the male and that that vaginal plexus provides a cavernous plexus for the clitoris.

AUTONOMIC NERVOUS SYSTEM.

The autonomic system has been divided into Sympathetic (thoracico-lumbar outflow) and the Parasympathetic which latter is divided into cranial outflow (first from the mid-brain and second from the medulla) and into Sacral outflow. These groups of sympathetic and parasympathetic fibres are separated by the cervical and lumbar enlargements of the cord, which are devoted to the innervation of the somatic muscles of the limbs.

According to Gaskell when the sympathetic and parasympathetic are distributed to the same structure, the effects are antagonistic. The sympathetic inhibits the movements of the stomach and bowels, the parasympathetic increases them.

The sympathetic contracts the exit from the bladder, the parasympathetic relaxes it.

The parasympathetic causes contraction of the bladder and relaxes its sphincter. It also inhibits contraction of the muscles of the urethra and of those of the external genital organs.

The sympathetic inhibits contraction of the bladder and causes contraction of its sphincter and of the

urethra, as well as causing contraction of the muscles of the external genital organs.

Gaskell also points out that irregular and exaggerated contractions are due to irritation of the parasympathetic nervous system.

With regard to the innervation of a hollow viscus, the condition known as "polarity" exists. Elliot's law with reference to this phenomenon states that "When a quiet lodgement of contents is facilitated by the presence of the sympathetic inhibitory nerves to the body of the viscus, there will also be sympathetic motor nerves to the sphincter closing the exit."

Very little data is obtainable from the study of the morbid anatomy of the autonomic system and, until more is acquired, we must remain at a loss to explain diseases in which this system shows derangement.

Hughlings Jackson first gave to us the conception of the evolution of the nervous system in three levels. Jeliffe labels these the vegetative, the Sensori motor and the psychic levels. The first and lowest corresponds to the autonomic nervous system. The vascular and visceral musculature is innervated from the lowest level and is of a more primitive type than that supplying the skeletal muscles. Thus in foetal life the vegetative nervous system is paramount in its influence and control.

AETIOLOGY.

Although the condition was first described by Langenbeck in 1802 and later by Velpeau, it was not till the year 1870 when Tolmatschew described the condition in considerable detail, that it was recognised as a pathological entity. Four theories had been put forward to explain its aetiology, each finding supporters among a large list of eminent observers whilst Young, Frontz & Baldwin gave as their opinion that none of these views adequately explained the development of all the types of obstruction reported. This conclusion was formed after an extensive experience with the use of the cystoscope, and an intimate knowledge of what they held to be the same condition occasionally seen in the adult. Young, Frontz & Baldwin accordingly added to the list of theories, another which will be discussed in its turn.

Tolmatschew, who describes the condition in his case, - that of a male child dying shortly after birth, - says "Bands or folds 8 mm. long, 1 mm. broad and 1.5 mm. high were found running forwards from the verumontanum in the middle of the lower wall of the urethra. The bands arising from the verumontanum divided into two thin

tender membranes occupying the right and left halves of the urethra". "Each membrane was fastened to the wall of the urethra with its free edge directed backwards and so forming a pocket the hollow of which was directed towards the bladder".

Thus Tolmatschew thinks that the enlarged folds that are found are due to simple overgrowths of the normal anatomical structures. This view is taken by Lindenmann, Bednar, Schlagenhaufer, Englische, Knox & Sprunt, Bonnett & Wilckens and the last mentioned states "At the junction of the Pars membranacea and the pars prostatica there are two folds running downwards and forwards from the verumontanum and are continued on the lumen of the urethra in the form of valves. In this way on both sides pockets are formed. They are continuous with the normal folds".

Knox & Sprunt (1912) says "Recent workers in human embryology are at variance in their views on the development of the urethral canal. Felix in his article on the development of the urinary and sexual organs in Keibel and Mall's "System of Human Embryology", (Die Entwicklung der Harn-und Geschlechtsorgane Hanbuck der Entwicklungsgeschichte des Menschen) insists that the whole canal from the verumontanum to the sulcus

urinarius glandis is developed from the sinus urogenitalis and is of entodermal origin. Broman on the other hand accepts the view that the corpus cavernosum urethra is developed from the ectodermal or cloacal plate. "But even if we adopt this view which might explain Posner's case at the junction of the Pars membranacea and Pars bulbosa, the lesion we describe is too far posterior to be ascribed to failure of union between Ectodermal and Entodermal structure". "We lean" he concludes "to the view that we are dealing with a simple progressive malformation and not to arrest of development".

Another view was brought forward by Bazy in 1903, a view first suggested by Commandateur who in his article of 1898 writes. "We are dealing probably with an accidental arrangement due to an anomaly in development in the posterior urethra". In his article Bazy contends that the condition is analagous to the imperforate anus due to failure of the alimentary tract to unite with the proctodeum.

Quoting Tourneux in "Precis d'embryologie humaine" he says:- "It is therefore the persistence of the urogenital membrane which is only the anterior part of the cloacal membrane which will determine the congenital stenosis. According as the reabsorption of this membrane

is more or less complete one will have a variable degree of stenosis - a valve almost complete as in Bonnet's case, or one through which an instrument could be passed".

"The situation", says Bazy, "of this membrane as embryologists describe it, exactly corresponds to the position occupied by the valve removed by Mr. Bonnet and also to the resistances which I have discovered by the exploratory bougie. On the other hand it is to be understood that the situation is not always the same as the development is not always the same". Further he states: "It seems to me that there exist in the bulbar region of the urethra, valves, giving rise to congenital stenosis these being remnants of the urogenital membrane which have only partially disappeared. The stenosis of the urethra may therefore be either Congenital Pathological, or Traumatic. This classification is similar to that applicable to all other tubular structures of the body, especially the rectum which phylogenetically, resembles, in so many ways, the urethra".

Posner (1907) follows Bazy's view, as does also G.S. Thompson who in his article of the same year says, "The cloacal hypoblast and the invaginating perineal epiblast meet at a point at which septa appear analogous

to the anal and hymenal membranes". He adds "It is strange that the quondam presence of this part is not mentioned positively in the ordinary works on morphology and surgery". "Its presence may or would seem to be implied although not actually stated, by such expressions as "Congenital urethral obstructions" given, amongst other things as a cuase of hydronephrosis". This last statement seems to ignore the well authenticated fact that congenital urethral hydronephrosis is known to be produced by lesions at the meatus urinarius and at the posterior part of the fossa navicularis.

Lederer too supports this view. He took a series of sections of the valves for microscopical examination and showed that they did not contain any evidence of existing or pre-existing trauma or inflammation, and these two causes being ruled out he concludes that the condition is congenital and of developmental origin. He says "The membrane described in our case lies exactly there where ectoderm and entoderm meet. The membrane contains tissue of both ectodermal and entodermal origin. It seems probable that this obstructive membrane is the result of incomplete fusion of the two parts by arrested development".

Heinecke supports the mal-development theory.

He examined the folds with the microscope and described them as consisting of connective tissue and muscle tissue covered with flattened epithelial cells. He holds that irritation could not account for muscle fibres in the folds; and that a further ground for the assumption of maldevelopment is the age incidence, the highest being 16 years, while most had died shortly after birth. If irritation causes hypertrophy of the already existing folds, the condition might be expected in older persons.

W.H. Jordan (1913) a supporter of this view writes. "None of the text books describe a stricture of the prostatic portion of the urethra. Keyes says that a stricture in the deep urethra is exceedingly rare; one text book (Lydston, G.F.) Venereal and Sexual diseases, p.182, denies its existence below ¼ inch from the meatus".

"Such strictures", continues Jordan, "are caused by inaccurate apposition in the embryo of separately developed sections of the urethra. The stricture is endodermic in origin".

A further theory put forward by O.S. Lowsley in 1914 is that the condition is due to an anomalous development of the Wolffian and Mullerian ducts. In describing the presence of a thick band of tissue stretching downward

from the verumontanum on the floor of the urethra towards the membranous urethra on which it divided into two portions and then attached itself intimately to almost the entire circumference of the urethra, he says: "This case seems to be an anomaly of development of the Wolffian and Mullerian ducts rather than a defect in the urethra itself. These structures which in the male become the ejaculatory ducts and the utriculus prostaticus enter the prostate near its base and course in an oblique direction through that organ until they approach the urethra, at which they turn and for a short distance run parallel with its axis, finally opening into its lumen".

"It is rather difficult to explain why this particular anomaly should occur so frequently, as the point of obstruction in this and similar cases is above the junction of the pars membranacea and the pars bulbosa which is generally accepted as the point of division between that part of the urethra which develops from the Entoderm and that which is derived from the Ectoderm.

Felix does not agree with the opinion of Bronan, but maintains that the entire urethra from the verumontanum outwards is developed from the sinus urogenitalis and is of entodermal origin".

Young, Frontz & Baldwin sought for an explanation of

this condition in valves that had arisen from already existing folds, which appeared as valves before the process of urination had commenced, as opposed to the theory of acquired formation.

E.M. Watson in the Summary of his article entitled "The Structure of the Verumontanum" points out that there are three varieties of fibrous bands stretching out from the verumontanum. First, those directed backwards into the bladder and seen to the naked eye as little ridges of mucous membrane spreading out fan-like as they pass along the posterior wall to the neck of the bladder, and described by Continental observers as having a pig-mane-like appearance.

Second, those directed downwards and forwards from the verumontanum as two small ridges separating from each other as they leave the verumontanum and passing outwards to become lost on the walls of the urethra at about the junction of the pars membranacea and the pars prostatica.

Third, those that stretch from either side of the verumontanum and pass round the walls of the urethra at right angles to its long axis and thus form a more or less complete diaphragm. To these Jarjavay gave the name of "Iris variety".

Watson showed that these folds appeared during the

course of normal development and Young believed that the obstruction was caused by the development of valves ab initio at any of these three points.

DISCUSSION.

None of the foregoing theories seem to me to explain fully the cause of this condition.

Features common to all the cases described are:-

1. Dilatation and hypertrophy of the urinary bladder and posterior portion of urethra.
2. Hydronephrosis and hydroureters.
3. A narrowing of the posterior urethra at the junction of the pars prostatica and pars membranacia.

In the author's case and in some described in the literature no enlarged folds or valves were found. Several cases of normal adult males and full time foetuses were examined with a view to obtaining a correct representation of the normally existing folds. From the drawings appended, (Plates V & VI.) it will be seen that the folds in the normal cases are as fully developed or even more so than in the case of hydronephrosis described. After examing the drawings of the normal cases it can be readily understood that if there was any hindrance to the outflow of urine below the folds, these folds would, on account of the pressure, tend to get larger. This supports the view that the folds described by many authors are the result and not

the cause of the condition, and further, that after having developed, they form valvular obstructions to the outflow of urine and may, if the patient attains to adult life, be the only pathological condition discoverable in the urethra. I agree with Tolmatschew and his followers that the folds or valves are the result of exaggeration of normal folds. These folds were shown by Watson to be prolongations which pass backwards and fowards from the verumontanum or may pass round the urethra from the middle of that structure and form the "iris" variety of fold which led Bazy to think that this was certainly the remains of the cloacal membrane.

A series of sections of the folds was taken and stained with van Gieson and it was found that they consist chiefly of fibrous tissue bands surrounded by connective tissue and covered with mucous membrane similar to that lining the rest of the urethra. (Plates XIV. & XV.) No muscle fibres were demonstrated within the folds but at their base, the muscle fibres of the urethra were evident.

It is quite conceivable that when an obstruction occurs in the posterior urethra the small folds already present will, by the pressure of the urine, tend to become enlarged and to take on the form of pockets with

their mouths opening towards the bladder and thus exert a valvular action. The presence of mucous folds is noticed in congenital stricture of the pylorus at a place where they are not normally present. How much more likely then is it that these normal folds in the urethra should become enlarged under similar circumstances? It is worthy of note that in the cases recorded the presence of valves in a case of a full time foetus or younger is very uncommon, thus indicating that the presence of these enlarged folds is an acquired condition.

Again in some of the cases reported where the patients were seen in early life, the folds were too small to obstruct the outflow of urine to the extent necessary to produce the enormous hypertrophy of the bladder. Further, the clinical history of some of the cases indicated that the condition of retention was intermittent thus suggesting a nervous element.

It was found that in the treatment of this condition some cases on whom the passage of bougies alone had been performed are reported as cured. This operation is similar in effect to "Lorenze's" operation on the pylorus causing a stretching of the parts without any cutting operation. Those that adhere to the valve theory hold that the passing of bougies caused a rupture of the valves

and hence effected a cure, but in all probability the cure was effected by the same means as in the operation on the pylorus.

The main points against valve-formation being the cause of the condition are:-

1. First and chiefly. Valves or even folds are not always present in this condition.
2. Second. Folds are noticeable chiefly in those cases that have survived birth for some time.
3. Third. In some cases where folds were present the size of the folds was quite insignificant and therefore unable to produce the degree of dilatation and hypertrophy.
4. The fact that dilatation or stretching by means of bougies, cured some cases.

The maldevelopment theory in which the obstruction is alleged to be caused by the retention of part of the cloacal membrane has for its chief supporter Bazy, who bases his opinions on Bonnet's case in which valves were removed from the posterior urethra and from his own observation by use of the acorn headed bougie. Now the exact location of any hindrance in the posterior urethra is extremely difficult by means of instruments and even if the point of obstruction were at the exact situation where the two parts of the urethra of different origin met, (which it is not), that of itself would not prove its aetiology. Besides in almost all cases described

the folds or valves were considered to be either prolongations of the normal folds or to have a position identical with them. The illustrations of various cases recorded, point to the fact that the folds are really developed from normally existing folds. The "iris" variety, specially noted by Bazy, had its origin in the folds that run from the mid point of the verumontanum, at right angles to the long axis of urethra and at first sight this might be thought to support Bazy's view. And supposing this were a remnant of the cloacal membrane, one would scarcely expect such a membrane, with its normal propensity for disappearance, to be sufficient to cause the enormous hypertrophy found in the bladder in this condition. Bazy gets past the difficulty of the valve-like structures being at different points in the posterior urethra according as they are above, on a level with, or below the verumontanum, by saying "On the other hand it is to be understood that the situation is not always the same as the development is not always the same".

The recognition of the fact that the site at which the obstruction occurs has a relation to the position of the urogenital membrane draws our attention to the fact that that point forms the line of demarcation between the

two portions of the urethra of totally different origin and consequently of different nerve supply and to some extent of different blood supply.

Heineche supports the mal-development theory. In discussing the age incidence he says "The highest age is 16 years, while most had died shortly after birth". "If", he continued, "irritation causes hypertrophy of the already existing folds, the condition might be expected in older persons".

Now we know that five cases have been reported above the age of 16 years; three by Young, Frontz & Baldwin aged respectively 17 years, 26 years and 42 years, while one was reported by Inverson aged 25 years, and one by Picard aged 42 years. His advocacy of the mal-development theory which was based on facts then available is thus proved to be based on incorrect data.

With respect to Lowsley's contention that the condition is due to anomalous development of the Wolffian and Mullerian ducts, there is not sufficient evidence that obstruction is ever caused by this condition. At most, any obstruction caused by this means results from an enlargement of the verumontanum, but this enlargement has not been shown to be excessive in any of these cases. Any anomalous development noted in this situation is

is usually situated external to the urethra. (See diagram from Keith,(Plate VIII.)

While agreeing with Tolmatschew as to the origin of the valve-like structures or folds when present, one has still to look for the cause of the hypertrophy of these already existing folds and how they become sufficiently increased in size to cause backward pressure of the urine great enough to result in complete destruction of a major part of the kidneys. It has already been shown from my own case that almost complete destruction of renal tissue may exist in the absence of valves or even hypertrophied folds. The condition of the kidneys proves that the obstruction has been of lengthy duration and that it was neither complete nor continuous. Further in cases that have survived birth, it has been noticed clinically that intermittent retention was a common feature.

Young in his description of these folds or valves draws special attention to the fact that their free edges are turned towards the bladder. It has been pointed out by Luschka, Velpeau, Jarjavay and others that congenital valve-like structures when found in the urethra almost always have their free edges turned towards the meatus urinarius and only rarely do they occur with their free

edges turned towards the bladder.

If, as it is held in this article, these valve-like structures are acquired from already normally existing folds, then naturally they would certainly have their free edges turned towards the bladder.

As an explanation of the phenomenon that exists in this type of case Thomson wrote an article on "Defective Coordination". He suggested an analogy between three conditions:-

1. Congenital Hypertrophy of the Bladder with dilatation of the ureters and renal pelvis and with no organic obstruction.
2. Congenital hypertrophy of the Colon with no organic obstruction.
3. Congenital Hypertrophy of the Pylorus and Stomach wall.

In these three conditions hypertrophy of the muscular wall of the organ has occurred in intrauterine life without the presence of any organic obstruction save that caused by the excessive hypertrophy of muscle.

In discussing the origin of this hypertrophy Thomson puts forward two hypotheses.

1. That it is a primary developmental hyperplasia.
2. That it is a secondary hypertrophy from over-exertion.

1. <u>A primary developmental hyperplasia</u>.

"There are only two conditions that I can think

of under which muscular hypertrophy seems to occur without antecedent overwork.

(a) The extraordinary hypertrophy of the uterus which takes place during pregnancy; and

(b) Congenital Giantism, local or general, such as occurs in congenital hemi-hypertrophy, but be adds "I doubt very much however, whether there exists in human pathology or indeed in nature, a single instance of localised true hypertrophy of muscle being certainly, or even probably, primary in character.

2. Secondary hypertrophy resulting from over-exertion.

Hunter pointed out that all muscles had the power to hypertrophy when subjected to forcible contractions and the tendency to hypertrophy is greater in involuntary than in voluntary muscle. To this Thomson adds "were it not for the exceptions already mentioned, we might claim acceptance for a further axiom to the effect that localised true muscular hypertrophy is always a proof of past over-exertion".

At least it can be taken for granted that all muscle activity is due to stimulation either directly on the muscle itself or through its nerve supply.

It is true that in the case on hand and in a number of the cases examined in the literature there was no

trace of organic obstruction and therefore the hypertrophy was not the result of normal stimuli upon normally acting muscles such as one would expect if a definite organic stricture were present.

Thomson says "If a functional cause has existed, it must necessarily, I imagine, have been of the nature of a disturbance of the normal coordination". This normal coordination is well illustrated in the normal workings of most of the hollow organs such as the uterus, bladder, pylorus and stomach and portions of the bowel. This coordination as exemplified by the uterus is termed "polarity" and in this organ we find that when the uterus contracts the os dilates and vice versa. So too with the other hollow organs when normally acting. This quality is regulated by the autonomic nervous system.

It has been pointed out by Langdon Brown that "Irregular and spasmodic contractions are due to irritation of the parasympathetic system" and these contractions as contrasted with those of the "choreic type", are the very ones that bring about a marked degree of muscle hypertrophy.

"May it not possibly be a sort of Intra-uterine developmental neurosis?" asks Thomson. Accepting this suggestion, a possible explanation might be afforded by

assuming an incoordination arising out of want of harmony between the two divisions of the autonomic nerve supply, namely the sympathetic and the parasympathetic.

It is advanced that the condition is due to want of coordination between the sympathetic and parasympathetic systems. It has been shown by L. Brown that the parasympathetic system is responsible for the irregular and spasmodic contractions that give rise to hypertrophy in muscle but what actually causes the incoordination must remain unsolved till further knowledge is gained concerning the pathology of the autonomic systems.

According to Elliots' law namely "when a quiet lodgement of contents is facilitated by the presence of the sympathetic inhibitory nerves to the body of the viscus, there will also be sympathetic motor nerves to the sphincter closing the exit". This is what normally takes place in relation to the alimentary tract (oesophagus, stomach and bowel) as well as to the bladder so that if any incoordination or upset in the nervous mechanism to these several viscera exists, we should find as a result in the case of the oesophagus, a spasmodic contraction of the sphincter at its lower end with resulting dilatation of the lower portion of that tube.

In the stomach we should find a spasmodic contracture in the pylorus and hypertrophy with dilatation of the stomach. The stomach in the young child does not yield readily to dilatation but contracts violently causing projectile vomiting.

In the bowel a rare condition may exist at the ileo-caecal junction where the ileo-caecal valve undergoes irregular contractions and results in hypertrophy with dilatation of the lower end of the ileum.

In the pelvic colon and rectum a similar condition occurs, a condition known as Hirschsprung's disease.

So too in the bladder one finds the corresponding condition in the male of Bilateral Hydronephrosis hydroureters and dilatation and hypertrophy of the bladder and posterior urethra, while in the female one finds Bilateral Hydronephrosis with hydroureters.

It has been shown too that the autonomic or vegetative nervous system is paramount in its influence and control over these different viscera during foetal life whilst the sensori motor and Psychic levels come into action gradually after birth and gradually assume and ultimately gain some control over the vegetative system. Hence it comes about that any upset in this latter system shows itself prominently during foetal life.

From the examination of my case and those described in the literature, I am of opinion that this last is probably the correct explanation.

A similar condition occurs in females but with the one fundamental difference that in females there is no dilatation or hypertrophy of bladder and urethra. But it is argued that the urethra in the female is of different origin from the urethra in the male and one would not expect any hindrance or obstruction in the female urethra; but why not? The valve theorists cannot explain whereas according to the incoordination theory the lesions that do occur are just those that one would expect in the female. The hindrance in these cases occurs in the bladder wall at the lower end of the ureters.

It has been noted that the bladder and prostatic urethra in the male have the same origin and same nerve supply as the female bladder and the complete urethra. The nerve supply to the remaining part of the male urethra is analogous to that supplying the clitoris in the female. Now the incoordination that exists in the male is between the autonomic supply of the bladder and prostatic urethra, and the autonomic supply of the remaining part of the urethra.

In the female this cannot have any other effect on the bladder save that of voiding the urine instantaneously, but the damaging effect is produced higher up, namely at the lower ends of the ureters and this is what is borne out by any reported cases (Bilateral Hydronephrosis and Hydroureters in the Female by Smith & Shaw). In the female the recurrent spasmodic contractions of the bladder are quite competent to empty it of its contents but these contractions cause backward pressure on the ureters by prohibiting the continuous outflow from them into the bladder and thus causes hydroureters and hydronephrosis. This occurrence in the female, in my opinion, strengthens the view that the condition in all these cases is of nervous origin.

CONCLUSIONS.

In support of this latter theory this paper sumits and not without some degree of proof that:-

1. The point at which the obstruction occurs is at the junction of the Pars prostatica and the Pars membranacea.
2. No folds have been demonstrated at this point.
3. A thickening of the muscular wall of the urethra exists from this point backwards towards the

bladder.

4. The folds or what may be taken as valve-like structures when present, have developed from the normally existing folds in the prostatic urethra and in the drawing of the cases in literature can be traced to their origin in the verumontanum. They arise from the verumontanum either from its anterior or posterior edge or from its middle.
5. In some cases no folds exist and where they do, they occur in those cases that have survived for some time after birth. Only in one case have valves been reported in a full time foetus.
6. The folds are the result of mechanical pressure exerted by the urine on the normal structures. In this respect it is noted that mucous folds are produced in the pylorus even where no folds originally exist.
7. The muscle hypertrophy is due to the over-action caused by a want of harmony between the parasympathetic and sympathetic systems of the autonomic fibres either by direct action on the muscle itself or on the vessels.
8. In some cases other deformities are present as in this case a deficiency and scarring of the anterior

abdominal wall above the pubis, probably due to some action on the bloodvessels.

9. Cure of the retention may be effected in early cases by the passage of instruments causing dilatation of the narrowed urethra similar to Lorenze's operations for Congenital stricture of the pylorus. But in later cases in which the verumontanum flaps have developed, cutting of the folds may be necessary.

10. Analogous sites for a similar condition are found in the

(1) Lower end of oesophagus.

(2) Pylorus.

(3) Lower end of Ileum.

(4) Rectum.

CASES FROM THE LITERATURE.

1. Case of Fuchs:-

Autopsy: Foetus between 5 and 6 months.

The bladder was very much hypertrophied and dilated. The ureters were dilated and tortuous. Both kidneys showed hydronephrosis. The prostatic urethra was much dilated especially on its posterior wall with the verumontanum lying in the cavity. The sinus prostaticus and ejaculatory ducts were dilated. Running forwards from the verumontanum was a ridge which divided into two folds that separated from each other as they passed forwards to become attached to the walls of the urethra. The sinus prostaticus opened out into a dilated cavity about the size of a pigeon's egg, lying behind the bladder.

11. Case of Fuchs:-

Autopsy: on a full time still born child.

The bladder was dilated and hypertrophied. The ureters were dilated and the kidneys were hydronephrotic. From the verumontanum a number of fine folds radiated towards the bladder giving a pig-mane like appearance.

From the anterior end of the verumontanum a ridge extended forwards and divided into two folds which diverged from each other and were lost in the lateral walls of the urethra. There was a narrow opening between the folds.

Comments: It will be noticed that the folds or valve-like flaps are not described as being of any considerable size. It is definitely stated that a narrow opening exists between them. In both Fuch's cases the folds are described as occurring in the position at which the normal folds exist. It must be noted too that the early writers were not cognisant of the fact that normal folds did exist, consequently any indication of a fold was considered to be an anomaly.

111. Case of Commandateur. Autopsy.

Body of a male child weight 3100 grams. Death occurred shortly after a normal delivery. Placenta 520 grams. There were no external malformations on the body of the child.

The Bladder stretched from the pelvis to the liver margin. Pressure on bladder could not force out urine through urethra. The bladder contained 50 grams of

liquid. Its wall was thickened to 3 m.m. The inner surface was trabeculated, the muscle fibres forming projecting columns. The mucous membrane was healthy. The ureters were greatly convoluted and about size of the large intestine.

The kidneys were twice the normal size and cystic. The renal tissue was reduced to a thin shell.

Urethra: A stylet could not be passed from meatus into bladder. There was a semi-lunar valve measuring 1.5 m.m. thin and transparent attached to the lower end of the verumontanum. Urine Sp. gr. 1031. Albumen 6 grms.

Comments: The folds were thought to be an anomaly in development but it is noted that the valves arise just below and are attached to the lower end of the verumontanum the precise place where the normal folds exist.

IV. Case of Schlagenhaufer. (Plate No. XVI.)

A male child died 20 minutes after birth.

Autopsy: The bladder was dilated and hypertrophied and reached to the umbilicus. The internal sphincter and prostatic urethra were distended and the posterior wall of the prostatic urethra bulged outwards. The

wall of the bladder was 4 m.m. in thickness. The ureteral openings were widely gaping. The wall of the prostatic urethra was 4 m.m. in thickness. Before the urethra was split open it was found impossible to pass a sound through the urethra from the bladder whereas it passed through easily from the meatus urinarius.

Two folds pass from the verumontanum. "There is a funnel shaped stricture at the junction of the prostatic and membranous urethrae". "I consider the folds to be an abnormal development of the normal folds which owing to the blocked up urine and the driving power of the bladder, have been altered into this funnel shape".

Comment: Schlagenhaufer draws attention to the hypertrophy of the wall of the prostatic urethra as well as that of the bladder.

V. Case of Bednar from Tolmatschew.

Autopsy on a male child that had lived only twelve days. The body was that of an ill nourished child. There were no external deformities or abnormalities. There was some fluid in the pleural cavity and pneumonia at the bases of both lungs.

A sound passed easily into the bladder but when the bladder was opened and a sound passed into the urethra

from the bladder it stuck in the valves.

The bladder was not dilated but its wall was three times its normal thickness. The inner lining of the bladder was trabeculated. Both ureters were enlarged and their walls thickened. Both kidneys were hydronephrotic and there was atrophy of the kidney substance.

The verumontanum split immediately at its anterior end into two valves which represented the mucous membrane folds. These two valves were concave towards the bladder but a narrow exit was left between them.

Vl. Case of Jordon. (Plate No. XVII.)

A male child at one month was noticed to dribble urine continuously and died at seven weeks.
Autopsy: A fibrous stricture was found at the posterior urethra measuring $\frac{1}{4}$ inch in length. The bladder was small and ureters dilated. The kidneys were cystic and the renal substance atrophied.

Comment: There is in this case no mention of flaps or valves. But there was a stricture due probably to the hypertrophy of the wall of the prostatic urethra. According to Jordon it was due to inaccurate apposition in the embryo of separately developed sections of the

urethra.

V11. Case from Young, Frontz and Baldwin. (Plate No.

Patient aet. two months, complaint at one month. "Vomiting and having not voided urine for two days", it was noted that the abdomen was distended. The bladder could be definitely felt as a hard rounded mass half-way to the umbilicus. An unsuccessful attempt was made to pass a catheter. At seven weeks admitted to hospital. X-Ray after bismuth meal showed a normal gastro-intestinal tract. At eight weeks the distension of abdomen increased and exploratory laparotomy carried out. The same day the patient was transfused with mother's blood 45 c.c., convulsions developed and death ensued.

Autopsy: The bladder was not dilated but its walls greatly hypertrophied, measuring 9 m.m. in thickness. The bladder wall was trabeculated and the uteral orifices were larger than normal. On attempting to pass a probe through the urethra from above downwards, an impassible obstruction was met at the prostato-membranous junction. No obstruction encountered on passing it in the opposite direction. Internal sphincter was dilated

to 6 m.m. in diameter. The prostatic urethra was dilated. The verumontanum was more prominent than normal and "springing from its anterior aspect and continuing down the midline of the urethral floor, was a hypertrophied ridge which bifurcated at the prostate apex to be continued as membranous folds closely adherent to the urethral wall. They fused in the middle line but a tiny opening was present on the posterior wall (See Plate

Both kidneys were slightly lobulated. The left soft and fluctuant. The right kidney showed a marked hydronephrosis and the right ureter measured .75 c.m. in diameter. The left kidney showed a marked hydronephrosis and its ureter was elongated, tortuous and dilated, measuring 1.5 c.m. in diameter.

Remarks: Condition quite compatible with author's theory, namely a fuller development of existing folds.

VIII. Case from W.H. Fletcher.

A male child aet. three months admitted to hospital for distension of the abdomen. On examination three swellings were felt, one over each kidney region and one over the bladder. An operation was attempted but had to be abandoned on account of the child's condition. Death occurred next day.

Autopsy: The body was that of a male child aet. three months.

Both kidneys were greatly enlarged, the left being the more so. Both were hydronephrotic and much of the renal parenchyma was destroyed.

The bladder was dilated and hypertrophied. The ureters were dilated. "Stretching across the prostatic portion of the urethra was a thin membranous looking septum, formed by a projection of the mucous membrane of the posterior part of the circumference of the urethra. This septum formed a partial or incomplete diaphragm with its unattached edge directed towards the bladder. In addition there was a loose tag of tissue attached by one end to this diaphragm with its fine end pointing towards the bladder which also impeded the flow of urine.

1X. Case of Young, Frontz and Baldwin.

Patient aet. 3 months, well developed and well nourished and seemed normal physically. He lost weight rapidly, developed a cough and was admitted to hospital and died soon after admission.

Autopsy: Both kidneys were slightly enlarged and showed on section slight hydronephrosis. Both ureters were also dilated and tortuous. The bladder was small but its wall were considerably thickened. The vesical orifice

orifice was somewhat dilated. On passing a probe into the urethra from the bladder, an obstruction was encountered in the region of the verumontanum which was passed with some difficulty. No obstruction, however, was evident when the probe was passed in the opposite direction, "thus demonstrating the valve-like nature of the obstruction as is usually seen". The verumontanum was specially prominent. The urethra was opened in the midline posteriorly but "no valve or stricture was demonstrated".

X. Case of Lowsley. (Plate No.

A boy aet. $3\frac{1}{2}$ months. Died shortly after admission to hospital with oedema of lungs. There was nothing abnormal complained of by his parents regarding his urination.

Autopsy: The bladder was greatly hypertrophied. The internal sphincter of the bladder and the prostatic urethra were both dilated widely. The verumontanum was 3 m.m. in height and six small bands extended backwards from it reaching to the internal sphincter.

Extending forwards from the verumontanum was a thick hard band of tissue which divided into two portions and these reached down towards the membranous urethra and became attached to almost the entire circumference

leaving a small slit-like opening to the left of the median line.

The ureters were dilated, lengthened and tortuous. Both kidneys were dilated and cystic. The right spermatic cord showed a large hydrocele but the remaining external genitalia were normal.

XI. Case of Lindeman.

A boy aet. four months was admitted to hospital with oedema of eyelids and ankles. While in hospital he did not pass urine and died soon after admission. Autopsy: Both kidneys showed hydronephrosis and great destruction of renal tissue. Both ureters were dilated. When the urethra was opened up two pockets were seen similar to the two fingers of a glove diverging from each other as they passed downwards. The adjoining walls of the two fingers being formed by the prolongation of the bifurcating fold which proceeded from the anterior end of the verumontanum.

XII. Case from Young, Frontz and Baldwin.

Patient aet. six months. Admitted to hospital with otitis media and with "no hestory of symptons referable to the bladder" but two days after admission it was noted that the bladder was greatly distended.

Catheterization was unsuccessful because of an obstruction in the region of the external sphincter. Under local anaesthesia supra-pubic cystostomy was done. Examination showed considerable dilitation of the prostatic urethra and internal sphincter. "Digital palpation revealed a valve-like obstruction across the roof of the mid portion of the prostatic urethra. Very little regarding the character of the obstruction could be learned". The valve was forcibly broken with the finger". The supra pubic wound healed in two months and the patient voided with perfect freedom.

Remarks: No valves or folds seen. Digital palpation revealed and treated the condition. If in six months the patient was quite well does this not suggest that the condition was an acquired one?

XIII. Morton's Case.

A Baby thirteen months was found to be in a wasting condition. Its abdomen was distended. It passed urine apparently normal in quantity. The catheter passed into bladder easily and the hypogastric swelling disappeared. Blood and pus were noticed in the urine during next twenty four hours and the temperature rose.

Death occurred a week after admission.

Autopsy: The bladder was dilated and hypertrophied. The ureters appeared like small intestines. Both kidneys were hydronephrotic but considerable renal tissue remained. "A small valve-fold was found in the roof of the urethra just beyond the vesical orifice directed downwards and backwards, so that although the passage of urine would be interfered with a catheter would not be obstructed.

XlV. Case of G.S. Thompson.

Boy aet. fourteen months had a history of pain and straining during micturition. On examination there was anal prolapse. A large mass was felt reaching from the umbilicus to the pubes which did not disappear on catheterization. The abdomen was opened and the bladder incised and drained but the patient died shortly afterwards.

Autopsy: Both kidneys were hydronephrotic. Both ureters were dilated and the bladder was dilated and hypertrophied. At the junction of the bladder with the prostatic urethra "a diaphanous membranous septum lying flush with the wall of the opened urethra" was found. There was a small opening in this septum.

XV. Case from Young, Frontz & Baldwin.

Patient aet. fifteen months. July 30th 1916.

"First 6 months of his life he did very well". At the age of 6 months he began to lose weight and vomited frequently. At 10 months pus was found in urine. On admission the child was emaciated, under-developed and cried incessantly. The bladder was palpable to the umbilicus and the external genitalia normal. Urine had colon bacilli and contained pus cells and a large amount of albumin. Because of marked distension of the bladder, a No.6 urethral catheter was introduced with some difficulty, with-drawing a large amount of urine. Six days after he became rapidly worse, refused his feedings, developed projectile vomiting; temperature rose to 107° and death ensued.

Autopsy: The findings were negative except for the genito-urinary tract. The right kidney was half again as large as normal and showed a moderate grade of hydronephrosis. The ureter was elongated and tortuous and measured from 0.5 to 2 c.m. in diameter. The left kidney showed a greater degree of destruction. The left ureter was about twice the diameter of the right. The bladder was contracted and its wall hypertrophied measuring 1.5 c.m. in thickness. The vesical orifice was dilated to 1 c.m. in diameter. Below this the prostatic urethra was even wider, measuring at its

widest 2 c.m. On passing a probe downward from the bladder it encountered obstruction 2.5 c.m. below the internal sphincter. A probe introduced the other way through the urethra passed very readily into the bladder without encountering any obstruction.

The entire urethra was opened in the midline anteriorly "disclosing a remarkable condition". "Just at the apex of the prostate and attached to the entire circumference of the urethra in a slightly oblique direction was a fold of tissue quite thin and fibrous looking. This extended upward from the floor of the urethra for a distance of 4 m.m. while on the lateral walls it projected into the urethral lumen for a slightly greater distance. The urethra above the obstruction extended laterally below the upper level of the valve forming quite pronounced pockets into which the probe undoubtedly lodged when it passed from above downward. The prostatic urethra was quite smooth and "nothing resembling the verumontanum was seen". When the urethra was closed a small oval slit 3 m.m. by 6 m.m. existed in the centre of the diaphragm.

Remarks: This valve like structure due to the bulging of verumontanum and pockets forming on either side of it, shows that it is the verumontanum that is forming what

is called the valve.

XVI. Case from Young, Frontz & Baldwin.

Patient aged twenty months. On August 1913 it was admitted with the complaint of bladder trouble. It was a full time baby, appeared normal at birth and did well until five months old when it was noticed to have difficulty and pain in voiding urine. It was thought to be due to a tight prepuce and the foreskin which was dilated. At ten months the child was said to have had typhoid. The ysuria persisted and circumcision was performed but no relief was given.

Examination: The patient was a fairly well nourished boy.

A note at time is as follows:- There is a mass continuous with the bladder which extends to the level of the umbilicis. Several unsuccessful attempts were made to pass a soft rubber catheter ranging in size from No.6 - 9. (French).

In each case the catheter met with an obstruction after passing through the external sphincter. No urine came through the catheter. A filiform bougie was readily passed into the bladder after which a ureteral catheter could be passed. A large amount of urine was recovered. Five weeks later a suprapubic operation was

carried out. The bladder was dilated and hypertrophied, the vesical orifice was dilated and just beyond it in the prostatic urethra a small vertical valve like obstruction could be felt on the left side. This was more or less semi-circular in outline and extended from the floor to the roof. It was seized with a clamp and destroyed with the electro-cautery. There was no further obstruction. The patient was discharged four weeks after the operation, voiding urine with ease. His general health improved and he remained well for one year, finally dying of diphtheria.

Remarks: This seems a genuine case of a fold being present but then this is argued that it is an acquired condition. If congenital could the condition go on so long without showing any symptoms?

XVll. Case from Young, Frontz and Baldwin.

Patient twenty-one months. August, 1913.

Birth normal at term. For ten months before admission, urination had been painful, and periodically (about every two weeks) he had suffered with distension of the bladder. At such times he would go for 36 hours without voiding. During this period of retention he had been unable to sit up because of pain.

Examination showed a well developed, well nourished child.

His bladder was distended reaching to umbilicus. Attempt to pass rubber and metal catheters failed because of an obstruction 7 c.m. from meatus. A ureteral catheter was finally passed and 500 c.c. of urine recovered.

At twenty-four months the bladder was opened subrapubically. It was found to be dilated and hypertrophied. The vesical neck was dilated. When a small sound was passed through the meatus, it met an obstruction in the region of the external sphincter. A large probe was bent in the shape of a sound and after some difficulty it was passed from the anterior urethra into the bladder. A perineal urethrotomy was performed. "The point of obstruction seemed to lie somewhat above the bulb although its exact nature was not determined". "The urethra beyond the urethrotomy incision was forcibly dilated with a large sound "thus rupturing the valve". "Both suprapubic and perineal wounds healed in one month and the patient was quite well in 1919.

Remarks: That there was an obstruction there can be no doubt but "its exact nature was not determined". The passage of large bougies forcibly dilated the contracted urethra, "thus rupturing the valves".

XVlll. Patient aet. two years. January, 1913 was

admitted because of hydrocephalus. Urine contained pus and albumin. No history of previous urinary symptoms was obtained. But while in hospital patient had periods of complete urinary retention but was always catheterised with ease. He was last admitted to hospital in 1916 when urinary retention and infection were prominent symptoms. Death occurred in February, 1916.

Autopsy: The genito urinary findings were alone of interest in this connexion.

On opening posterior urethra, a remarkable condition was seen. Beginning at the internal sphincter and extending well below the verumontanum a considerable dilatation was noted. From the anterior aspect of the verumontanum an hypertrophied ridge was seen coming down the mid-line. When the region of the external sphincter was reached, this diverged to the left ending in a thin fibrous fold which was attached to the urethra throughout half its circumference. The bladder was quite small and contracted, and its wall considerably hypertrophied. The ureteral orifices were only slightly dilated but both ureters were greatly enlarged. The circumference of left ureter was 4 c.m. The pelvis of kidney was dilated and looked very thin. The right kidney showed a lesser degree of destruction.

Remarks: Noticed that the supposed valves in all these cases is the prolongation from the verumontanum.

XlX. Case of Wilckins.

L.R. aet. 2¼ years born of healthy parents. Up till fourteen days before death child had no illnesses. He entered hospital suffering from diphtheria with considerable difficulty in breathing. A tracheotomy was performed but death occurred the following day. Autopsy: A sound was easily passed into the bladder via. the meatus. But when passed from the bladder it caught in pockets.

The bladder was greatly dilated and hypertrophied. The thickness of the bladder wall was 3 c.m. The internal sphincter of the bladder was hypertrophied but could not completely close the bladder. The prostatic part of the urethra was greatly dilated. The verumontanum was slightly enlarged. "At the junction of the pars membranacea with the pars prostatica there were two folds running from the verumontanum and containing on the lumen of the urethra in the form of valves. In this way on both sides pockets were formed. They were continuous with the normal folds. On the anterior surface of the urethra, these folds came near each other but did not touch".

The ureters were both thickened, dilated and tortuous, the kidneys were dilated, the left being more so than the right.

XX. Case of Lindeman.

A boy aet. four years was admitted to hospital suffering from diphtheria, the duration of which was eight days. Of his previous condition, there is no history. Twelve hours after tracheotomy was performed the patient died.

Autopsy: The upper respiratory passages showed the usual findings for diphtheria of pharyna and larynx. Genito urinary findings:- The bladder was hypertrophied and the prostatic urethra was dilated.

The external genitalia were normal. The kidneys were both hydronephrotic and the uretera were widely dilated.

On opening the bladder and urethra, the bladder wall was found to be thickened and its inner surface trabeculated. The verumontanum was prominent and from its anterior end a fan-like arrangement of folds extended down the urethra. The median fold measuring as much as 1 c.m. Between the divergance of these folds a small slit of 3 m.m. allowed the escape of urine from the bladder.

XXl. Case from Young, Frontz and Baldwin.

Patient aet. four years December 1917. No urinary trouble till seventeen months at which time patient was operated on for vesical calculus but no calculus was found. Vesical papilloma was diagnosed and fulgurations were carried out through the suprapubic fistula. The patient was admitted two years later with suprapubic fistula. There were two pin hole openings in the bladder through which all the urine came. When these closed the child ran a fever and had great difficulty in urinating. On cystoscopic examination no evidence of tumour was found. The suprapubic fistula was excised and the wound healed. For a short time after his return home the patient had little or no difficulty but soon had a return of the urinary obstruction and temperature.

In February 1918 the bladder was opened and found to be the size of a walnut. The vesical orifice was dilated up as was also the posterior urethra. A catheter followed by a large sound was passed through the posterior urethra into the bulb. "While no actual obstruction was demonstrated, it seems probable that the dilated posterior urethra was caused by a congenital obstruction in the membranous urethra and the case is therefore included in this Report".

Remarks: No evidence whatsoever adduced in favour of any valves or even folds. The simple dilatation of the urethra cured the condition.

XXII. Case of Heinecke. (Plate No. XX.)

Patient a boy aet. five years.

Complaint: difficulty in urination since birth. He dribbled constantly between the intervals of catheterization. The catheter met with some obstruction in the posterior urethra. Ten days after admission patient became worse. A suprapubic cystotomy was carried out but patient died shortly after.

Autopsy: The spleen was enlarged. The kidneys were enlarged and contained small abscesses. The capsule was thickened. The pelvis of the kidney was greatly dilated and both ureters were dilated.

Diameter of ureters:-

	Right	Left
At junction with pelvis of kidney	0.9 c.m.	1.0 c.m.
Middle of ureter	1.7 c.m.	1.8 c.m.
Immediately above the bladder	1.9 c.m.	2.5 c.m.

The bladder wall was hypertrophied.

The thickness of the bladder wall measured 1.2 c.m. and there were petechial haemorrhages in the mucous membranes. "Upon opening the urethra, the lumen appeared nowhere to be widened or narrowed. From the

verumontanum two half-moon shaped folds stretched downwards in gentle curves, to be attached to the sides of the urethra. In this way the pars prostatica was shut off from the pars membranacea as by two barriers".

Microscopic examination showed that the valves were made up of connective tissue covered with mucous membrane. Smooth muscle fibres were also found in the deeper part of the folds.

XXlll. Case of Knox and Sprunt. (Plate No.

A boy F.S. aet. five years was admitted to hospital June 26. The birth was normal. From birth he had always to wear napkins. At three years, he had measles followed by a chronic otitis media.

At four years he complained of loss of weight and strength and moderate diarrhoea.

On examination: he was pale and rickety.

Lungs and heart normal. Abdomen was distended and pendant.

On palpation a soft movable and lobulated mass could be felt in the left lumbar region. A similar mass was felt on the right side.

A large bladder was palpable. The external genitalia were normal but the external meatus was too narrow for the smallest catheter.

Urine examination: Slightly turbid.

Spec. Gravity 1002.

Albumen a trace.

Sugar Nil.

Pus cells and red blood corpuscles present.

He was discharged as "condition improved", on July 13. Readmitted January 1912 - five months later with condition getting progressively worse and died after repeated convulsions.

Autopsy: The kidneys were both hydronephrotic and both ureters were greatly distended, diam. 1.5 c.m. The bladder, which reached half-way to the umbilicus, was dilated. By firm pressure on the bladder a small stream could be expelled from the meatus. The bladder measured 7 c.m. from apex to internal meatus. The lining of the bladder was trabeculated. A probe passed through the urethra from the meatus and from the bladder met with obstruction in the prostatic urethra.

The internal meatus measured 2.5 c.m. Folds stretched down from the bladder to the verumontanum. "Immediately below the verumontanum the ridge of which it forms a part, divides into two prominent diverging folds which soon fuse with the anterior walls of the urethra

instead of fading out gradually on the posterior wall of the membranous urethra as usual".

Just below the verumontanum between the diverging folds there is a small equilateral triangular opening whose sides measure 3 m.m. A probe passed through the urethra from the meatus presents in this opening and abuts. against the hypertrophied verumontanum. Anus, Rectum, Seminal vesicles and vas deferens are normal. Microscopic findings:-

The urethra was lined by stratified pavement epithelium. The folds below the verumontanum were covered by a similar type of cells but that of the anterior urethra was desquamated.

Bladder wall was thickened, muscle bundles very large. The mucous lining showed scattered mononuclear cells.

The ureters were thickened. The epithelial lining was normal and well preserved.

XXIV. Case of Lindeman. from Young, Frontz and Baldwin.

A healthy looking boy 5½ years of age was admitted to hospital complaining of a swelling in the bladder region. He suffered no pain but passed urine with a very thin stream. He gradually got worse and death resulted before a diagnosis was made.

Autopsy: The bladder was hypertrophied. The ureters tortuous and widely dilated. The kidneys were both hydronephrotic. The pars prostatica and isthmus were widely dilated. From the posterior limit of the verumontanum ran three folds diverging towards the bladder. From the anterior end ran two other folds which formed valve-like structures leaving only a narrow opening for the urethra.

XXV. Case of Lederer. (Plate No.

A boy with no history of illness till at four years, suffered from measles. Between the years of six and seven he had scarlet fever which ran a normal course of four or five weeks. Shortly after the scarlet fever he complained of pain in urinating and of some retention.

Shreds were at that time noticed in his urine. He continued in indifferent health till admission to hospital at the age of eleven years with albuminuria and vomiting, but died forty-eight hours after admission. The diagnosis was uraemia following old scarlet nephritis. Autopsy: Both kidneys were enlarged and hydronephrotic especially the left. The sufaces were nodulated and the kidney substance cystic, with marked destruction of secreting tissue. The ureters were both dilated. The

The bladder was dilated and this dilatation extended into the prostatic urethra. The internal orifice of bladder measured from 2 to 4 m.m. Bladder wall measured 0.6 to 0.7 c.m.

Difficulty was experienced in attempting to pass a sound through the urethra both from the bladder and from the meatus urinarius. The resistence occurred a short distance anterior to the verumontanum by a semicircular diaphragm with its concavity backwards. Apart from a slight degree of phimosis the external genitalia were normal.

XXVl. Case of Posner.

A boy aet. eleven years was quite healthy till he developed scarlet fever which was followed by pyelitis and cystitis with pus and blood in the urine.

On examination a large bladder was made out and there was a considerable amount of residual urine which however decreased with methodical catheterization. Posner says "When the catheter was inserted it encountered resistence in the bulbar region of the posterior urethra which was easily overcome. The condition appears to be that of a stricture of congenital origin".

Remarks: The frequent catheterization of an early case would thus appear to affect a cure by dilating up a

narrowed urethra due to the congenital hypertrophy. This case is rather indefinite.

XXVl. Case from Young, Frontz and Baldwin.

Patient aet. 12 years, May 1915. Admitted with history of difficult and frequent micturition since birth. This was thought at first to be due to a peno-scrotal hypospadias with contracture of the meatus.

On abdominal examination the bladder could not be felt, but passing up from the bladder region to the costal margins a large doughy sausage like mass could be felt on either side of the mid-line. Beneath the costal margins on either side, large soft structures apparently kidneys were palpable. The external genitalia were normal except for a peno-scrotal hypospadias associated with a considerable downward bending of the pelvis.

A small catheter was readily introduced withdrawing 700 c.c. of cloudy infected urine. Cystoscopic examination revealed both ureteral orifices were markedly dilated and the bladder was quite trabeculated. No obstruction was seen at the prostatic urethra.

A Thorium x-ray was now made. The interal sphincter was quite widely dilated, the dilation continued into the prostatic urethra where it ended abruptly. Both ureters were widely dilated, the right measuring 3.5 c.m.

in diameter, the left measuring 2 c.m. The left ureter was at least twice as long and more tortuous than the right. The right kidney showed a large saccular hydronephrosis meas 12 by 8 c.m. The left kidney was less dilated and meas 6 by 7.5 c.m. At operation a band was found in the prostatic urethra more or less crescentic in shape extending across the roof of the urethra. By means of a small rongeur the band was grasped and divided in three places. The diaphragm was quite fibrous. Patient made an uneventful recovery from the operation. Catheterization however recovered 150 c.c. of urine which is explained very probably by the double hydronephrosis present.

XXVII. Case of Budd.

A sailor aet. sixty-six years was admitted to hospital in an unconscious condition and died a few days after admission.

Autopsy: There was advanced hydronephrosis of both kidneys. The pelvis of the kidneys formed large pockets and contained a pint of liquid. The ureters were dilated to the thickness of the thumb but were of normal size at their entrance into the bladder when the valvular arrangement was such that urine could not be forced backwards from the bladder. The bladder was dilated

and its walls hypertrophied. The prostatic urethra was greatly dilated. There was a membranous fold or valve fixed to the upper wall of the urethra, immediately behind the pulb of the urethra. In front of the valve the urethral canal was perfectly healthy.

XXVIII. Case of Bazy.

A boy aet. fifteen years complained of nocturnal incontinence with retention crises preceded with difficulty of urination dating from birth. He had perfect control during the day. No symptoms of bladder or kidney trouble. No urethral discharge. On exploration the urethral canal a bougie meets with resistance near the bulb of the urethra on withdrawal. The urethra was dilated up with graduated bougies and patient was discharged and as he did not return a cure was considered to have been effected.

XXIV. Case from Young, Frontz and Baldwin.

Patient aet. seventeen November 1912.

History of having difficulty since birth in passing urine. He had to void every two hours during the day and once at night since he could remember.

No history of pain or incontinence.

One month before admission to the hospital his

eyesight became affected so that in reading the printed page was blurred and objects at a distance were indistinct. There was no dizziness, no headache, no oedema, no dyspnoea.

On examination at time of admission patient was fairly well nourished. The general physical exam was negative, the positive findings being concerned only with the urinary tract.

On cystoscopic exam no obstruction to the passage of the cystoscope was encountered. There was 475 c.c. of residual urine and the bladder capacity was 750 c.c. No obstruction was found at the prostatic orifice, in fact it was somewhat dilated. The bladder was considerably dilated and the right ureteral orifice widely dilated.

On examination of the urethra with the cysto-urethroscope a rather prominent ridge was seen coming along the floor of the urethra in its mid line between the external sphincter and the verumontanum. The ridge ended in the verumontanum coli was of about normal size.

The upper aspect of the verumontanum was bifurcated and from it were continued two thin folds which were apparently attached to the floor and lateral walls of the urethra in the region of the internal sphincter.

At a subsequent examination an attempt was made to

pass a straight urethroscope in the region of the internal sphincter; a slight amount of force was used and the instrument passed into the bladder.

Following this instrumentation the patient voided very much more freely. He held his urine for several hours and his former urinary symptoms largely disappeared. The patient lived for a year with no return of his former urinary symptoms. He died of pneumonia.

Autopsy: Bladder quite dilated and thin walled.

Right ureteral orifice markedly dilated measuring at least 1.5 c.m. in diameter. Right ureter tortuous and meas 4 c.m. in diameter as its widest portion. Right kidney was a mere shell containing apparently no renal tissue. The left ureteral orifice dilated to about quarter of that of right. Ureter tortuous and dilated measuring 2.5 c.m. at its widest portion. The left kidney showed considerably hydronephrosis.

Posterior urethra. Just beneath the internal sphincter was an opening more or less slit like in character passing from the lower region of the sphincter to the level of the verumontanum. On examination of the upper portion of the slip it was found possible to pass a large probe behind the bladder for a distance of 1 c.m.

The condition of the verumontanum was peculiar in

that it was bifurcated, the concavity extending toward the bladder. From each leg of the "V" there continued upward toward the bladder a fibrous ridge which extended at least 3 m.m. above the floor of the urethra. They ended in the region of the internal sphincter which appeared to be quite widely dilated. On examination of the remainder of the posterior urethra only slight if any dilatation was seen. From the lower aspect of the verumontanum and coming along the mid line of the urethral floor was a fairly prominent longitudinal ridge of tissue which rose from the surface of the urethra for about 1 m.m. This finally bifurcated on the region of the prostatic apex and gradually disappeared.

XXX. Case of Picard.

A patient aet. forty years.

Complaint: difficulty of urination. After admission to hospital developed sudden unconsciousness and signs of uraemic poisoning were evidenced by the twitching and frothing at the mouth.

History: Four years ago patient had an attack of acute retention and incontinence which was relieved by catheterization.

On examination: There was oedema of the legs and the urinary bladder was palpable. There was no paralysis.

Catheterization revealed an obstruction in the posterior urethra. Patient rapidly became worse and death ensued. Autopsy: There was congestion of the brain and fluid in the peritoneal cavity. The kidneys showed some destruction of renal parenchyma.

The ureters were dilated and the bladder wall was thickened.

XXXl. Case of Inverson.

Patient - man aet. eighty-five.

Complaint: difficulty in urination and the passing of blood in the urine.

The bladder was greatly distended and could be felt at the umbilicus. Frequent catheterization failed to recover any urine. A large prostate was palpable per rectum.

Patient died shortly after from uraemia.

Autopsy: There was marked dilatation of the prostatic urethra. The crista urethralis divided into two thin folds which formed a cup-like obstruction in the urethra.

XXXll. Case of Tolmatschew.

Boy died soon after birth.

Autopsy: The genito-urinary organs alone of interest, the other organs being normal.

Bladder and urethra were opened medially. Valves

or folds were seen in the urethra arising from the ridge running forwards from the verumontanum. This ridge was 8 m.m. long, 1 m.m. broad, and 0.5 m.m. in height. It ran down from the verumontanum along the floor of the urethra.

This ridge divided into two thin tender membranes occupying the right and left half of the urethra. Each membrane was fastened to the wall of the urethra with its free edge directed backwards and so forming a pocket, the hollow of which was directed towards the bladder. The part of the urethra in front of the valves was normal.

The bladder was dilated and hypertrophied. The internal sphincter and the prostatic urethra were greatly dilated and formed a continuous cavity with the bladder.

The kidneys were atrophic with cystic spaces measuring 2 m.m. throughout the renal tissue.

The pelvis of kidney was not enlarged.

The utriculus prostaticus opened at the centre of the verumontanum, and the opening was found to be in communication with a multilocular sac lying on the posterior surface of the bladder shown in diagram.

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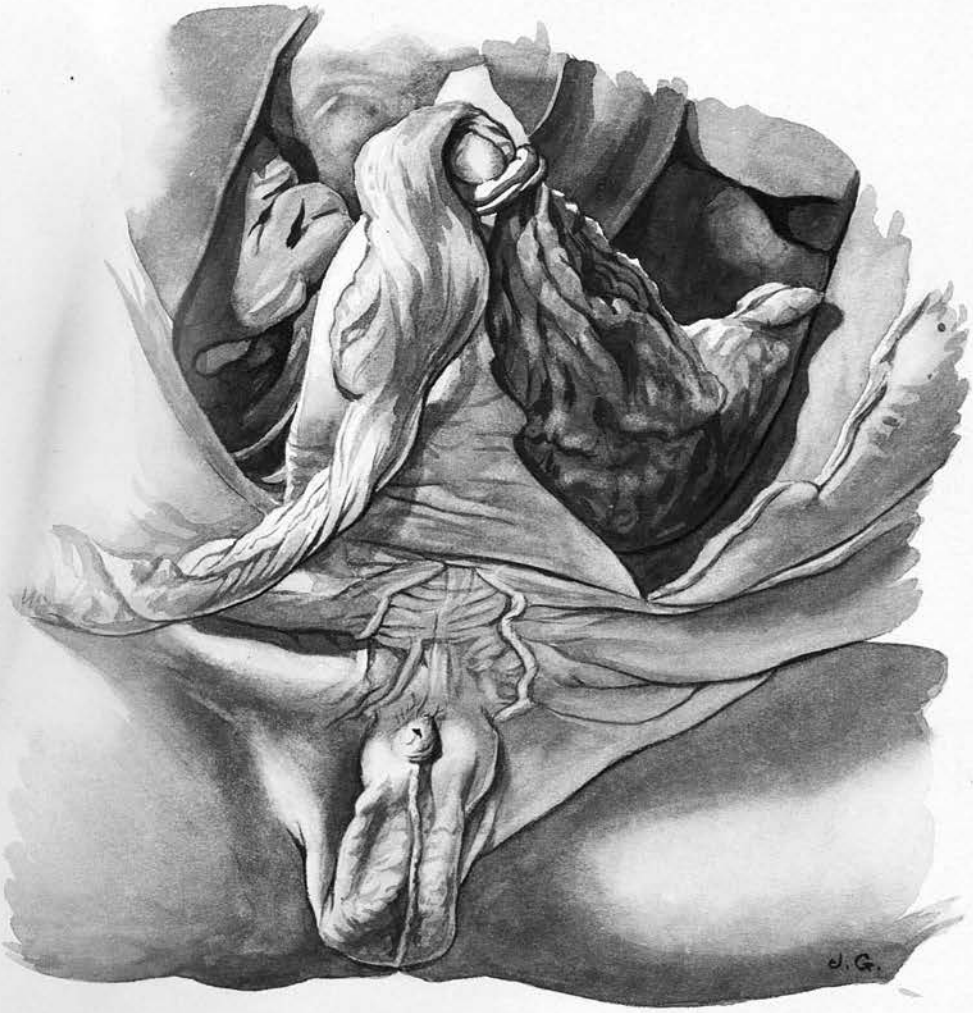


PLATE I

PLATE II

To show parts in Situ.

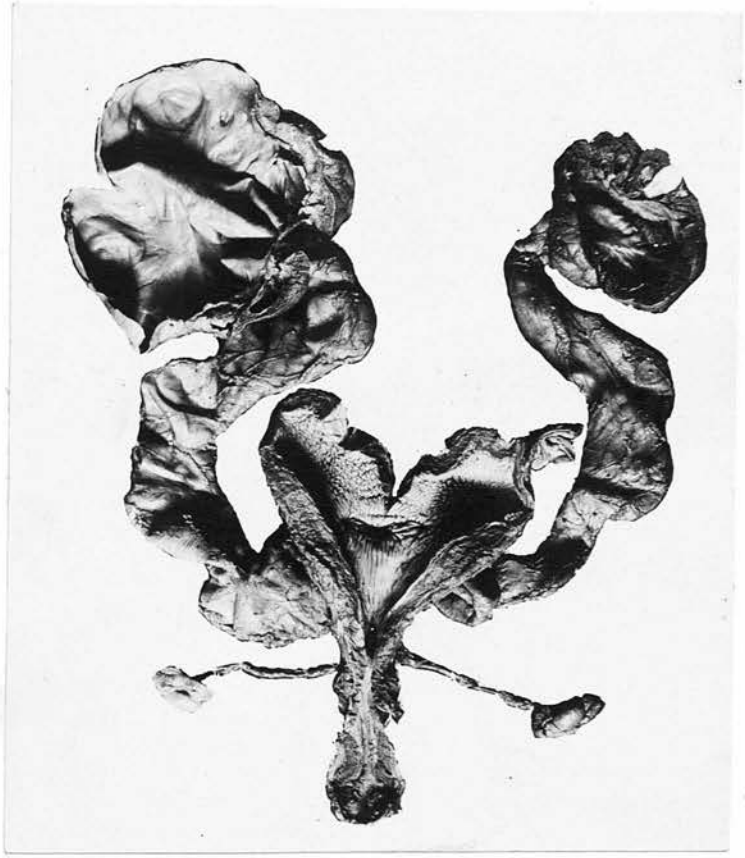


PLATE III

PLATE IV

BLADDER and URETHRA

Opened to show Bladder Wall, Verumontanum, and Normal Folds, Etc

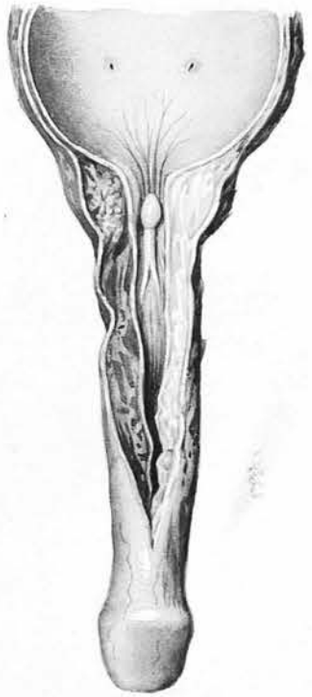


PLATE V

NORMAL URETHRA

Of Full Time Foetus

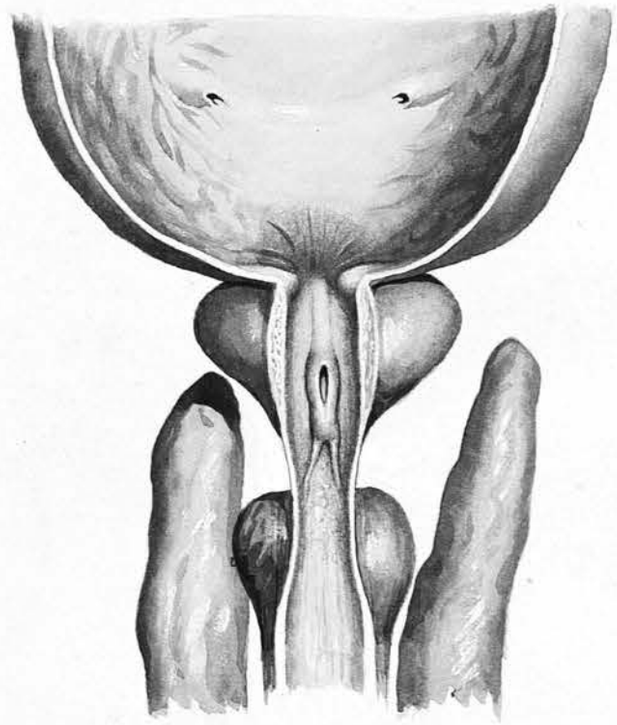


PLATE VI

NORMAL MALE ADULT URETHRA

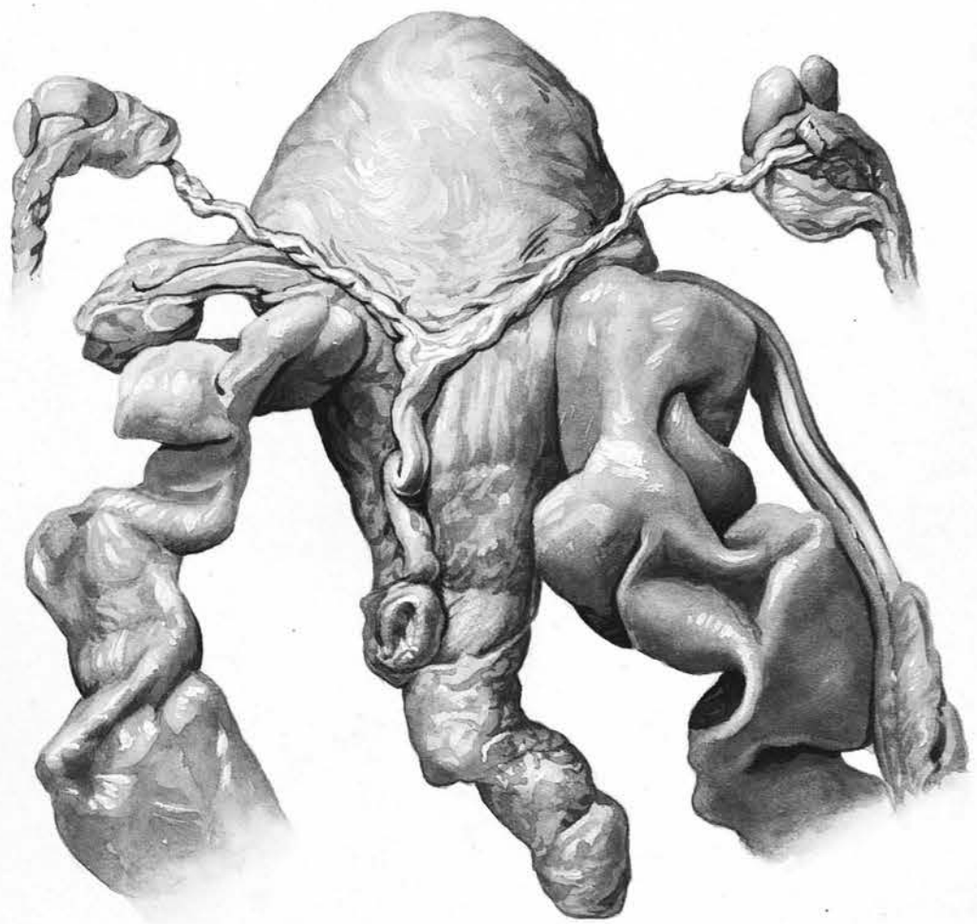


PLATE VII

POSTERIOR VIEW

To show Dilated Seminal Vesicles.

PLATE VIII

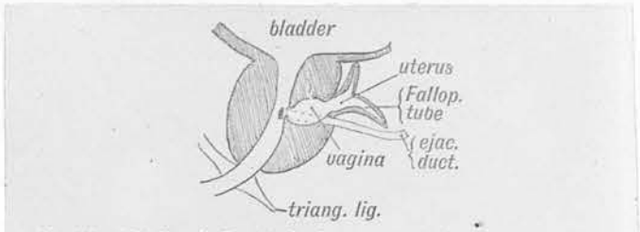
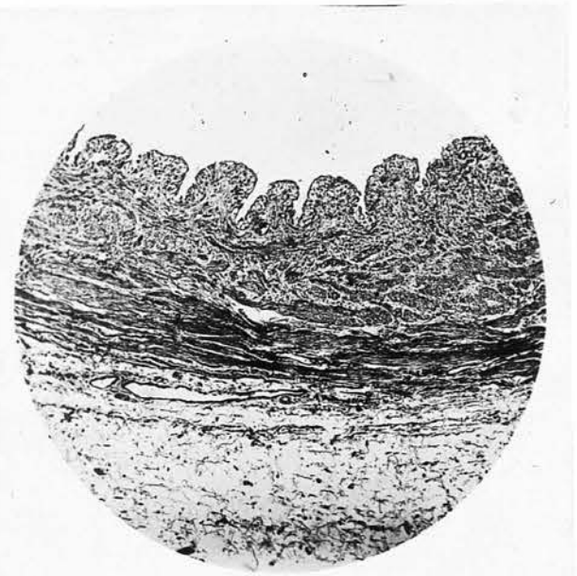


FIG. 399.—A Section of a Prostate showing an unusually developed Uterus Masculinus. (After Primrose.)

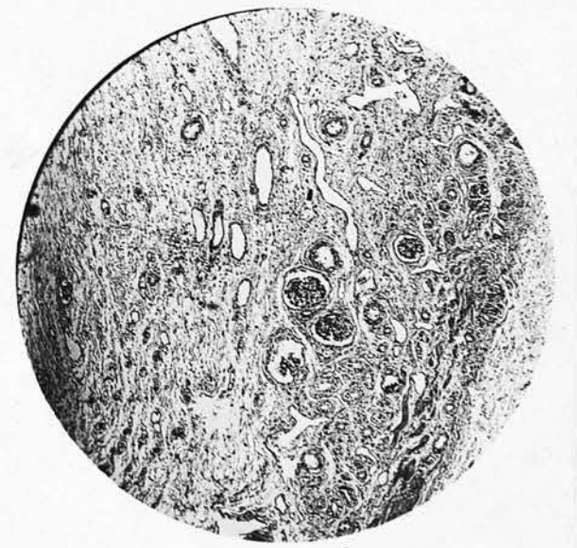
FROM KEITH

PLATE IX



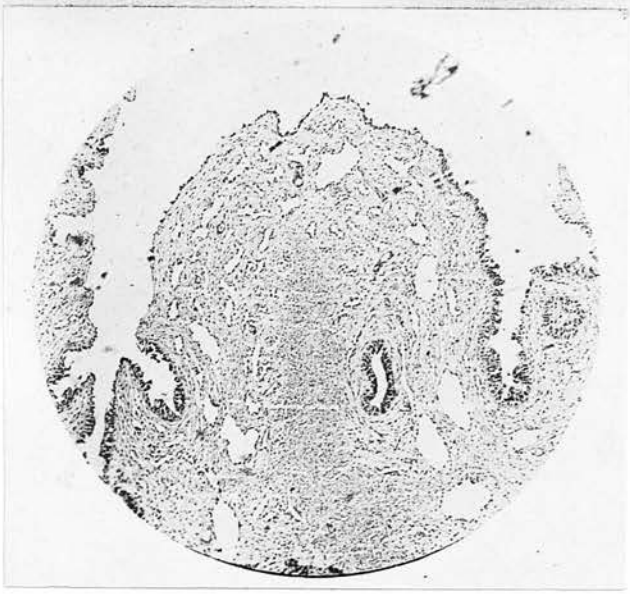
WALL OF URETER

PLATE X



SECTION OF KIDNEY

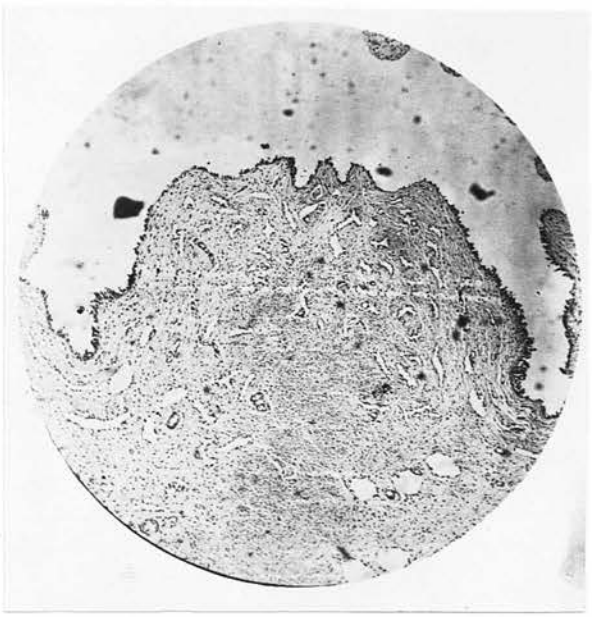
PLATE XII A



JUST BELOW VERUMONTANUM

through fold before division

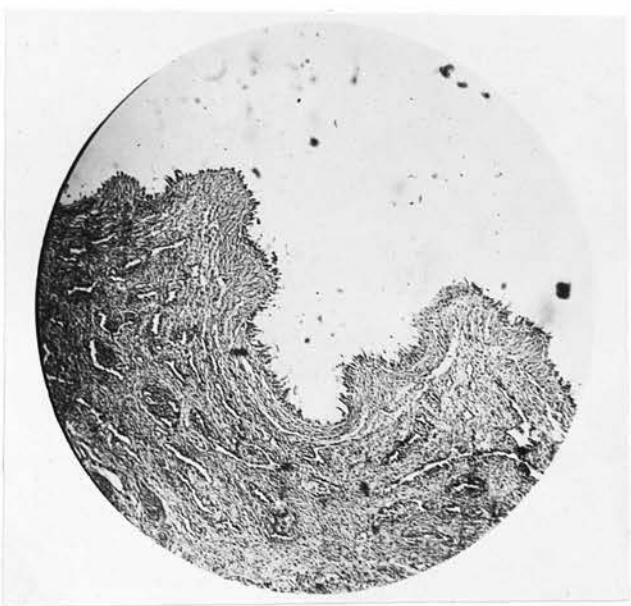
PLATE XII B



THROUGH THE FOLD LOWER DOWN,

division of folds just beginning

PLATE XII C



DIVISION COMPLETE

the folds distinct

PLATE XIII

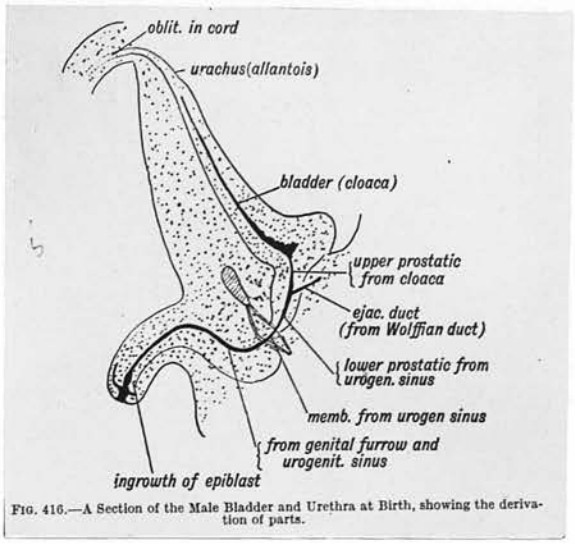


FIG. 416.—A Section of the Male Bladder and Urethra at Birth, showing the derivation of parts.

FROM KEITH

— EULYOLOGY —

PLATE XIV

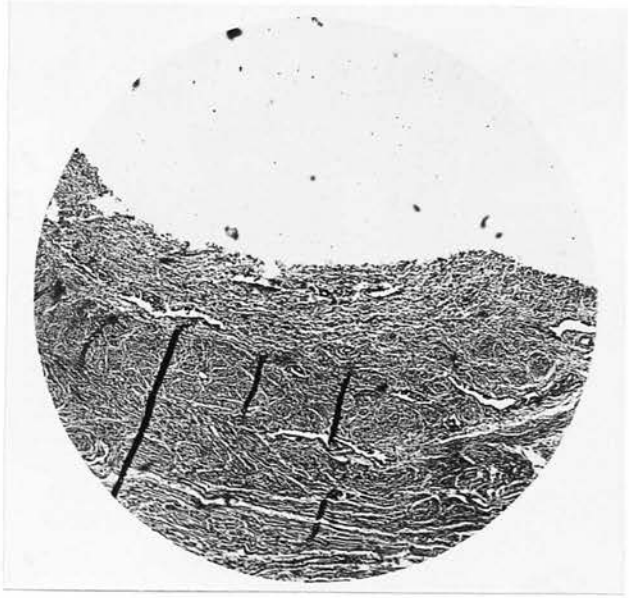
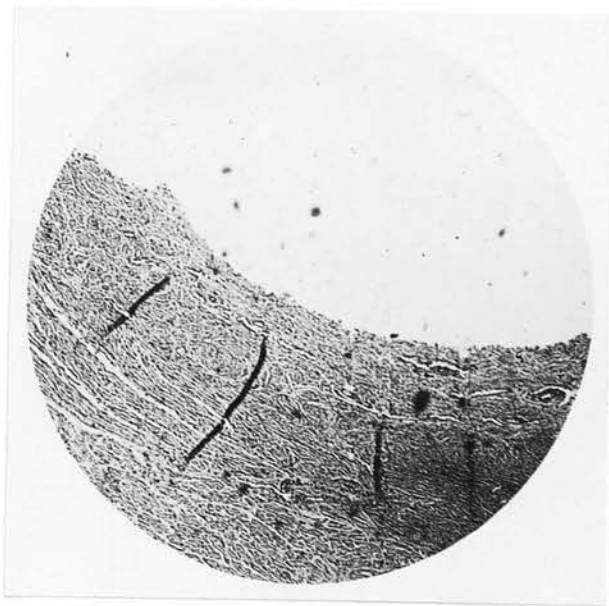
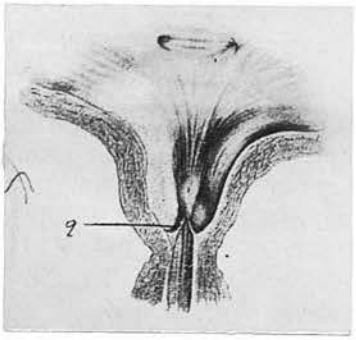


PLATE XV



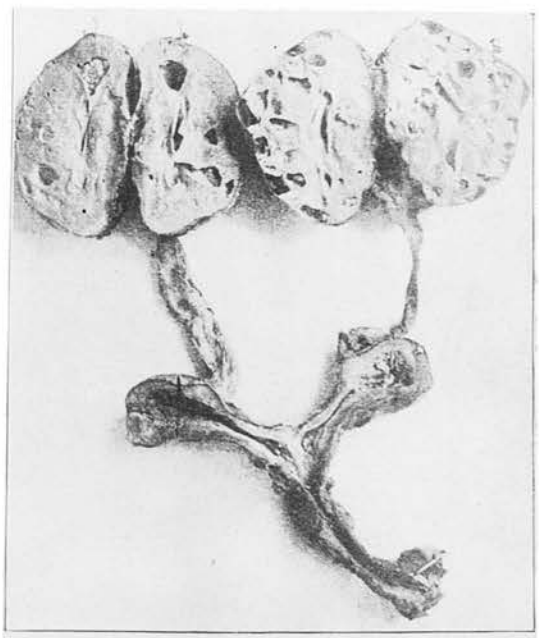
SECTION THROUGH THE FOLDS

PLATE XVI



WEIN KLIN WCHNSCHR 1896 PAGE 268

PLATE XVII



Congenital stricture of the prostatic urethra. Hyperplasia o bladder. Ureteral dilatation and multiple abscesses of both kidneys

V. H. JORDAN

JOUR. AM. MED. ASSN. JULY 26th 1913

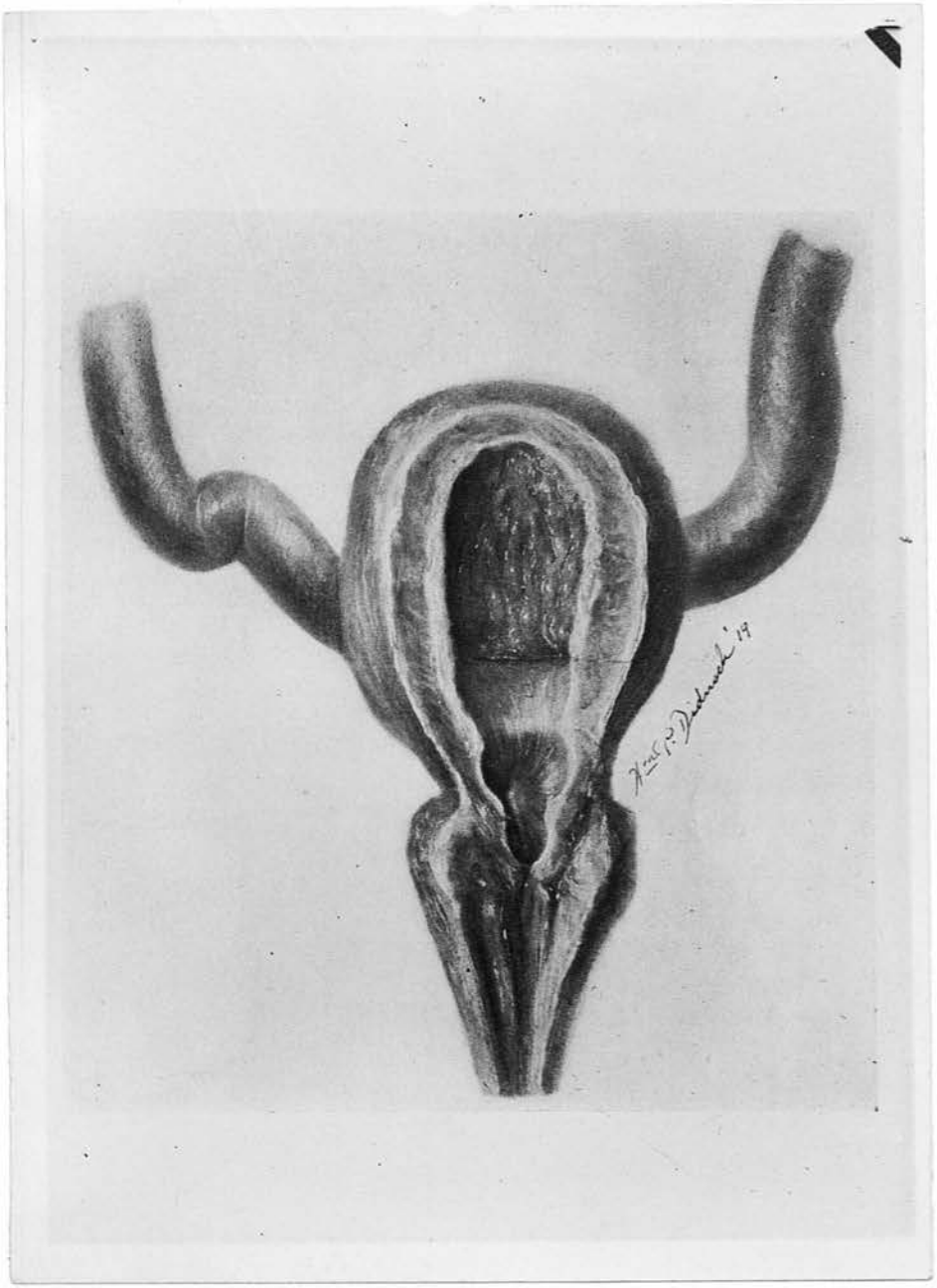
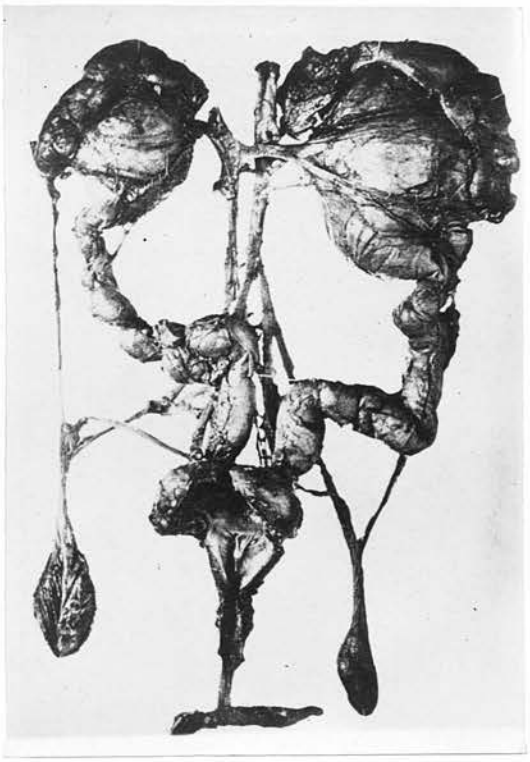


PLATE XVIII

YOUNG, FRONTZ & BALDWIN

PLATE XIX A

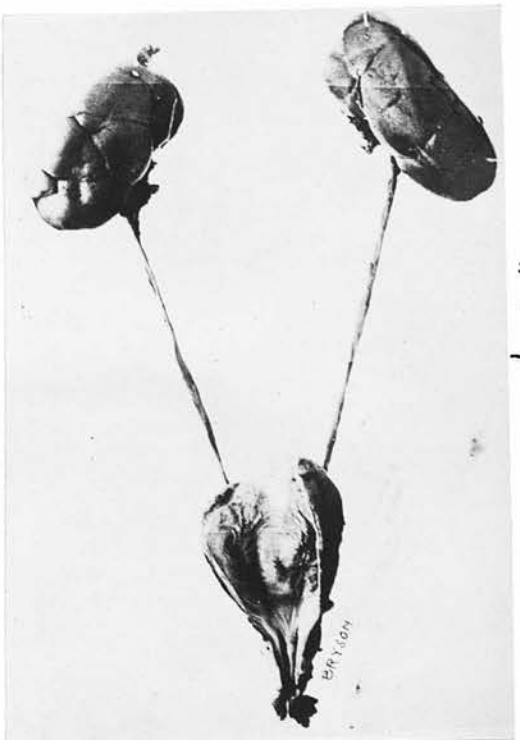


LOWSLEY

NORMAL BLADDER & KIDNEYS

of a four months' old boy.
(3/4 natural size)

PLATE XIX B



ANT. VIEW OF CASE

showing hydroureter and hydro-
-nephrosis in boy age 3½ months
-½ natural size-

Arm. Surg. LX 1914 Page 733

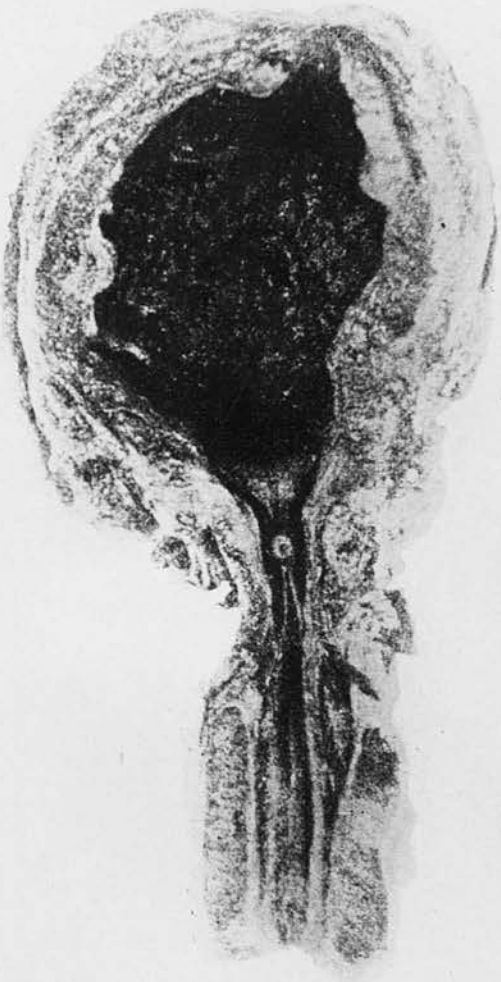
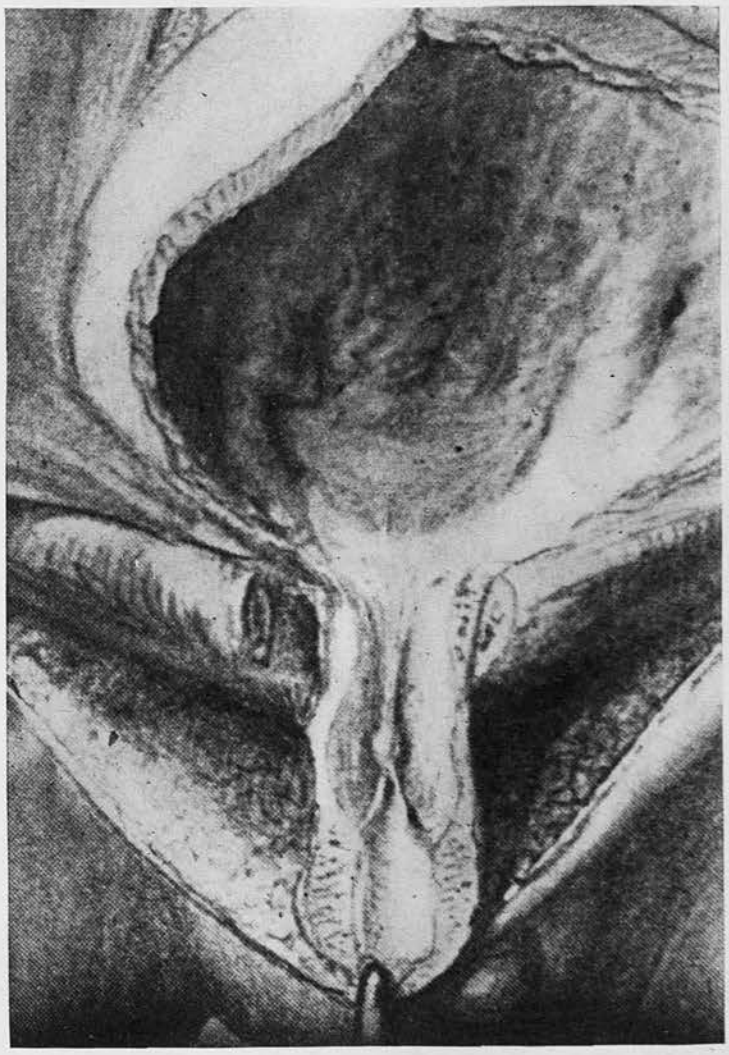


Illustration Showing Folds Originating at Verumontanum, Obstructing Posterior Urethra

From article by Heinecke, E. Zeitschr. f. Urol., vii. See case 14.

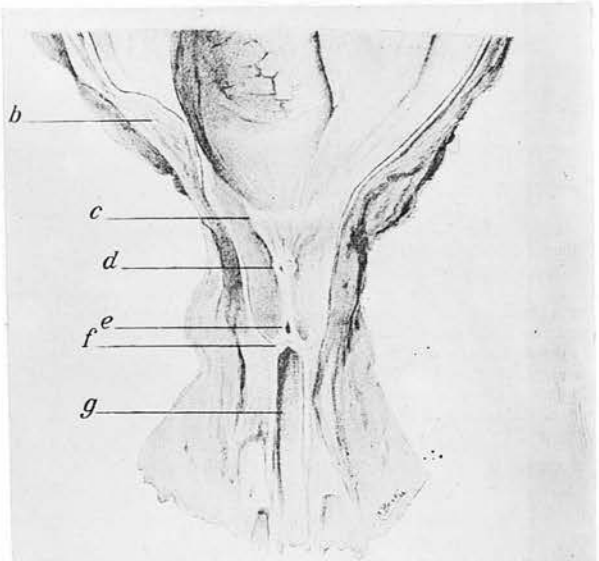
PLATE XX



ENLARGED PHOTOGRAPH OF DRAWING FROM ARTICLE BY KNOX AND SPRUNT

(See Amer. Jour. Dis. Child., lx, 1912.) Showing more in detail the situation and nature of the valvular obstruction. See case 15.

PLATE XXI



rnblase. *c* Orificium internum urethrae. *d* Colliculus seminalis, *e* schlitzförmige Öffn der Membran, *f* verschließende Membran, *g* Pars membranacea urethrae.

PLATE XXII

LEDERER

Arch. f. path. anat. 1911 page 240

PLATE XXIII

TOLMATSCHEW

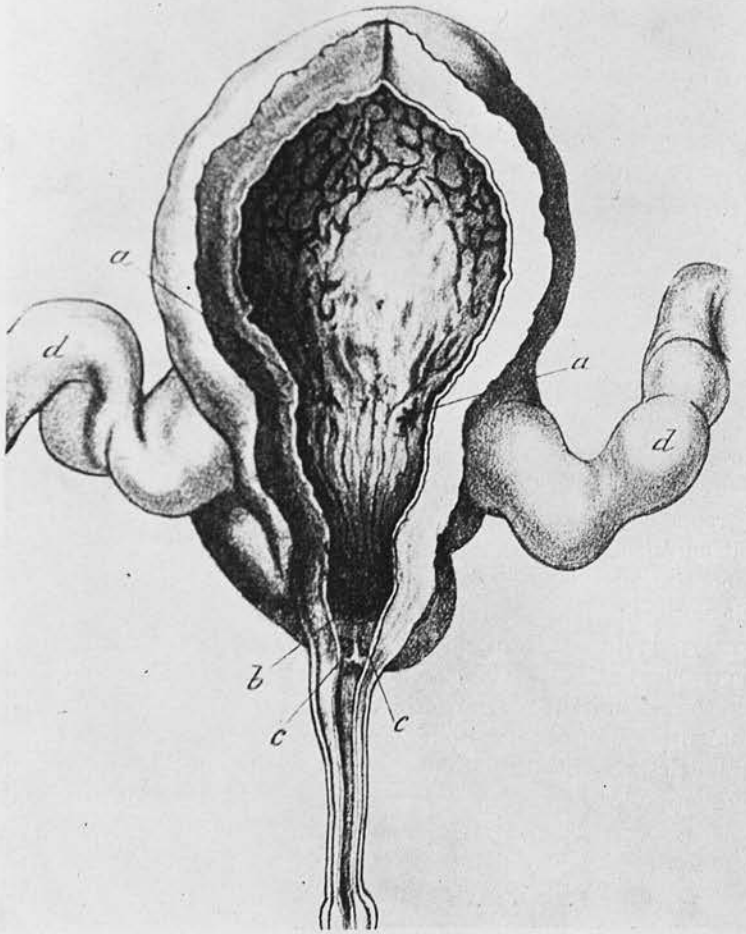
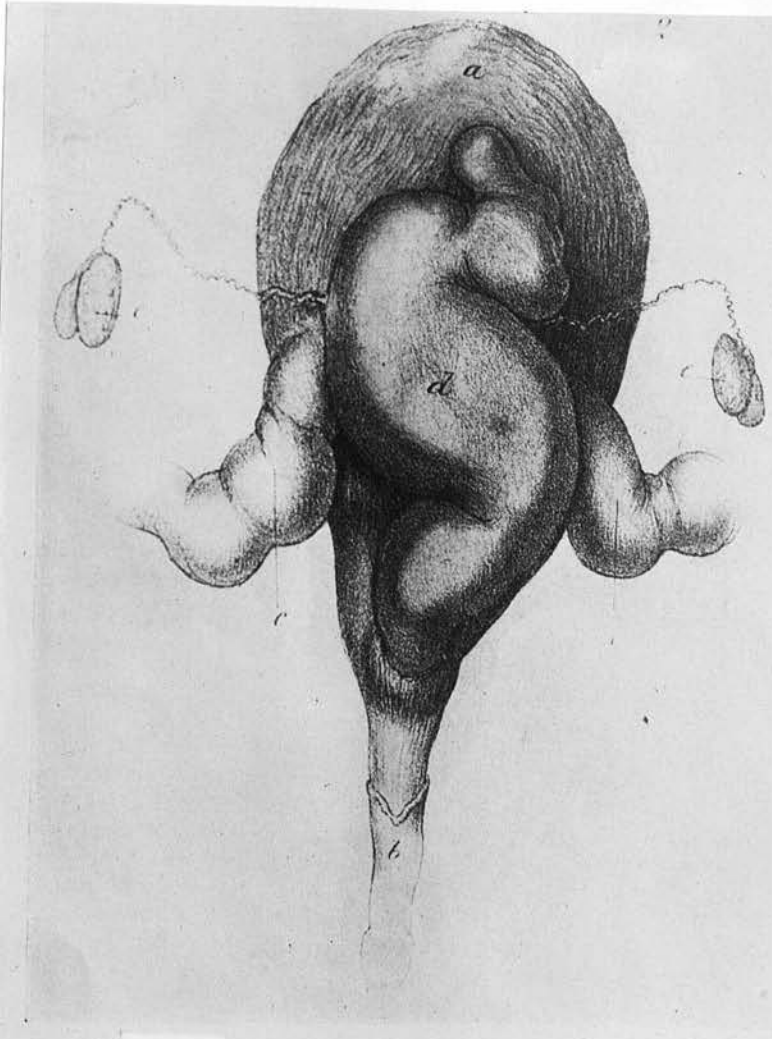


ILLUSTRATION SHOWING RESULT OF FAIRLY COMPLETE OBSTRUCTION ON POSTERIOR URETHRA, BLADDER AND URETERS

The valves are of type 1. From article by Tolmatschew in Archiv. f. Path. Anat., 1870, 11. See case 24.



POSTERIOR VIEW OF TOLMATSCHEW'S CASE

Showing enormous size of utriculus prostaticus. Archiv f. Path. Anat., 1870, 11. See case 24.