

## **IX. FACTORS CONCERNED IN THE FORMATION OF RENAL ANOMALIES WITH REPORT OF AN UNUSUAL CASE**

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From a standpoint of embryology the mammalian kidney occupies a very unique position among the other abdominal organs. Every one who has studied comparative embryology knows that the permanent kidney or metanephros is preceded by a rather completely developed organ the mesonephros or Wolffian body which itself is the successor to a more primitive organ the pronephros or primitive kidney. Peculiarly enough the adult kidney which is the permanent successor to this primitive organ does not contain in its structure a single element which was part of the pronephros. Degeneration of the pronephros in the cephalic portion occurs before the caudal portion reaches its full development.

The mesonephros or temporary kidney may be regarded as a direct continuation of the pronephros and forms one of the prominent organs of every mammalian embryo. Here the Wolffian duct which remains from the pronephros continues its growth caudad finally establishing connections with the cloaca. At this juncture we see the beginning of the permanent kidney, the development of which occurs from two separate and distinct parts, one giving rise to the uriniferous tubules which are concerned with the secretion of the urine, the other to the excretory system, the collecting tubules, papillary ducts, pelvis of the kidney and ureters which carry off the secretions. Both, however, are derived from the same germ layer the mesoderm. An outpouching from the Wolffian duct where the latter joins the cloaca indicates the beginning of the ureter the distal portion of which expands giving rise to the primary divisions of the renal pelvis.

This bud springing from the Wolffian duct is embedded in the delicate mesodermal tissue which now undergoes gradual differentiation manifest at first by a condensation of the mesenchyme. In human embryos of 13 to 19 mm., small spherical masses are formed within this nephrogenic tissue. Each of these spherical masses gives rise to a uriniferous tubule which during

its final stage of differentiation establishes connections with the collecting tubules, which, as I have mentioned before, are developed independently .

From the foregoing we may draw the following conclusions relative to the development of the kidney.

1. That the mammalian kidney is the permanent successor to the pronephros and mesonephros.

2. It begins to form near the caudal extremity of the mesonephros at a time when the latter is at its greatest development and ranges second in size only to the liver.

3. That the two principal parts of the kidney, namely the secretory and excretory arise in close relationship to each other but from separate anlagen.

4. And lastly that the normal location and functioning is dependent upon the proper migration and fusion of the various parts.

Therefore, it is not difficult to realize that anomalies of the kidney are quite common. On the contrary, it is surprising that they do not occur with greater frequency. The various anomalies may be classified as follows:

a) Anomalous locations of one or both kidneys due to failure of the organ to ascend from their embryonic position.

b) Fusions of varying degrees between right and left kidney giving rise to so-called horseshoe kidney.

c) Lobulated kidney is the persistence of the embryonic condition.

d) Duplication of one or both ureters.

e) Failure of fusion between the uriniferous tubules and the collecting tubules resulting in cysts and often destruction of the entire organ.

Since the fully developed organ always bears a definite relationship to the blood supply one may expect some very unusual vessels in connection with the first group of anomalies.

The case which I desire to report belongs to this group and it is interesting to know that the individual was never aware of this condition. He died of pneumonia at the age of 54 years, and the discovery of the renal condition was made in the dissecting room.

The left kidney, about twenty per cent larger than normal, was located in its proper position. The renal vessels, the pelvis and the ureter showed no abnormalities. The right kidney, about

half normal in size and atypical in form was found just midway over the ileo-pectineal line.

This case then presents an anomaly of location due to an arrest in its upward migration. The question naturally arises, "What factors have been responsible for this condition".

A study of the misplaced kidney reveals the organ to be lobulated.

The pelvis still shows its division into four primary parts; The blood vessels are of especial interest since they deviate completely from the normal renal vessels. Two arteries, one derived from the anterior surface of the aorta and the other from the left iliac artery just below the bifurcation of the aorta, form the chief blood supply. Two smaller vessels derived from the

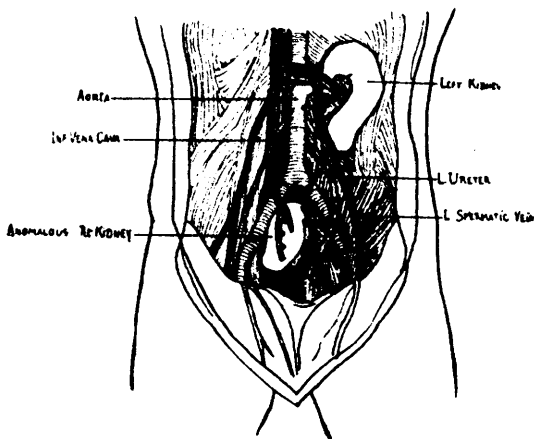


Figure 1.

hypogastric arteries are accessory. One renal vein drains the ventral and lower pole, loops over the right iliac artery to join the inferior vena cava. The other vein draining the dorsal and upper portion passes around the left iliac artery to join the left iliac vein.

Histological sections revealed that this kidney had been functioning though probably subnormally.

If we recall the site of origin of the metanephros we may conclude safely that the causes which interfered with the normal

development of this organ appeared as early as the fifth or sixth week of development.

The anomalous blood supply must be held as the principal factor responsible in the production of this abnormal condition and the cause underlying the latter was a failure of development of the main blood channels from the capillary network permeating the undifferentiated tissue. This may have been brought about by unequal growth within or pressure from without the embryo.