

or blood, or both, in the urine, and in the enlargement of the kidney itself. He also performed a one-sided nephrectomy and showed that albumin sometimes appeared in the urine following such an operation, but that by tying the aorta below the level of the renal arteries, together with the above mentioned operation, the appearance of albumin in the urine was more likely to occur. None of Robinson's animals lived more than four and one-half days.

Robinson's work, as well as that of several other investigators, Meyer² (1844), Frerichs³ (1851), Goll⁴ (1854), Ludwig⁵ (1856), Munk⁶ (1864), Erythropel⁷ (1865), Stockvis⁸ (1867), Weissgerber and Perls⁹ (1877), Litten¹⁰ (1879), Posner¹¹ (1880), Cohnheim¹² (1882), and Heidenhain¹³ (1883), has unquestionably established three facts in relation to complete or partial obstruction of the venous return from the kidney for periods varying from hours to a few days.

1. Albuminuria is produced.

2. Hematuria results, particularly if the lumen of the vein be greatly narrowed.

3. Numerous epithelial cells, singly, in groups, or as epithelial casts, appear in the urine.

There is not the same unity of opinion concerning the occurrence of casts in the urine under these conditions; Munk, for example, stating that fibrous and gelatinous casts (*Faserstoff und Gallert*) are never encountered except where nephritis coexists. Burkart¹⁴ also states that following ligation of the renal vein he obtained infarction of the kidney, but no casts in the urine. The consensus of opinion, however, is that casts do occur when the venous return is interfered with, having been described by Frerichs, Erythropel, Weissgerber and Perls, Runeberg¹⁵ and Litten.

Another phase, the effect of obstruction of venous outflow on the quantity of urine excreted, has also been investigated. Paneth¹⁶ (1886) in cleverly devised experiments on anesthetized animals in which known weights were allowed to make traction on a thread, the loop of which

2. Meyer: Arch. f. phys. Heilkunde, 1844, iii, 116.

3. Frerichs: Die Bright'sche Nierenkrankheit und deren Behandlung, 1851, p. 276.

4. Goll: Ztschr. f. rat. Med., iv, 78.

5. Ludwig: Physiologie, ii, 416.

6. Munk: Berl. klin. Wchnschr., 1864, i, 333.

7. Erythropel: Ztschr. f. rat. Med., 1865, xxiv, 217.

8. Stockvis: J. de méd., chir. et pharm., 1867, xlv, 22.

9. Weissgerber and Perls: Arch. f. Pathol. u. Pharmakol., 1877, vi, 116.

10. Litten: Untersuchungen über den hemorrhagischen Infarct, 1879, p. 3.

11. Posner: Virchow's Arch. f. path. Anat., 1880, lxxix, 311.

12. Cohnheim: Allg. Pathol., 1882, ii, 314.

13. Heidenhain: Herrmann's Handbuch der Physiologie, 1883, v, 324.

14. Burkart: Die Harncylinder, Berlin, 1874, p. 46.

15. Runeberg: Deutsch. Arch. f. klin. Med., 1879, xxiii, 225.

16. Paneth: Pflüger's Arch. f. d. ges. Physiol., 1886, xxxix, 515.