

converted into methemoglobin by the action of the acid urine. Such dark urine may be confounded with that caused by other dark pigments, such as indican or pyrocatechin, which occasionally are present.

Unaltered blood in small quantity is not very visible; but by inspecting the urine in a glass with a good light we can recognize, not only its peculiar color, but its characteristic dichromism, that is, by reflected light it appears red, while by transmitted light it is green.

The microscopical search for blood is so well understood now by all practitioners that it needs few words. If traces only are present, the lowest stratum of urine should be examined after standing some time. The corpuscles undergo many changes in urine, swelling up so as to lose their biconcave form, or shedding their hemoglobin, by which they alter in shape, appear vacuolated, and ultimately colorless. Such colorless disks may possibly be confounded with discoid oxalates and torulæ, but both these are smaller, the latter containing bright nuclei and being generally oval.

The main purpose of this paper is to deal with renal hematuria, but the difficulties of differential diagnosis are so great, that I should be wanting in honesty if I dismissed as foreign to my subject those cases which depend upon other causes. I must, therefore, at the risk of trespassing upon your patience, attempt to grapple with the subject in its entirety.

I think I may content myself with the bare statement of the fact that the urine of women is bloody during menstruation, or whenever there is vaginal or uterine hemorrhage. Hemorrhage from the urethra may be caused by villous growth, or in consequence of local congestion or injury. The blood is bright red, appears independently of micturition, or is not mixed with the stream, but occurs at the beginning or end of it, and is often accompanied by local pain or other symptoms.

Hemorrhage from the bladder may be caused by stone, prostatic disease, villous or malignant growths, cystitis, ulcer, parasites (Bilharzia), etc. In stone, prostatic disease, and cystitis, the diagnosis is not difficult, as these conditions have well-marked symptoms. The first two can soon be excluded by physical examination, while parasitic ova may be recognized by the microscope. But ulcer and growths in the bladder present peculiar difficulties, which may long baffle diagnosis.

We may commence by excluding the kidneys. Hemorrhage from the renal substance reveals itself by blood casts of the urinary tubules, but hemorrhage from the pelvis has no such constant sign, though casts of the ureter may be found. Renal hemorrhage is usually accompanied by local pain, while the history of injury, a blow, passage of calculus, etc., may help. Hemorrhage from the bladder is usually associated with some degree of cystitis and local pain, frequency of

micturition, etc. By passing a sound or lithotrite, fragments of growth may be obtained or an irregular ulcerated surface detected. Washing out the bladder may afford useful aid in obtaining fragments of the villous growth.

In women urethral dilatation and digital exploration constitute a safe and easy method of examining the inside of the bladder, while in males, after due consideration, an exploratory cystotomy may be performed. Above all, in these cases medicine must seek the aid of surgery, and surgery of medicine, or grave errors of diagnosis and treatment will be made. This remark applies to many other forms of hematuria, as we shall see.

*Renal Hematuria.*—Sir William Roberts, whose admirable book on Urinary and Renal diseases is by far the most valuable work on the subject in this or any other language, divides the causes of hematuria into three groups: (1) local lesions; (2) symptomatic; (3) supplementary; and adds: "Cases also occur which are not referable to any of these categories of which the origin is extremely obscure." This is his list:

1. *Local lesions.* External injury, violent exercise, calculous concretions, ulcers, abscesses, cancer, tubercle, parasites, active or passive congestion, Bright's disease.
2. *Symptomatic.* In purpura, scurvy, eruptive and continued fevers, intermittent fever, cholera, etc., mental emotion.
3. *Supplementary or vicarious.* To menstruation, hemorrhoids, asthma.

In one or two instances these may refer to other than real lesions, but the list is a useful one to modify and extend for our purpose, thus:

1. *Local lesions.* External injury, twisted or movable kidney, calculus, tubercle, cancer, syphilis, embolism, parasites, congestion, Bright's disease.
2. *Symptomatic.* Blood diseases (purpura, scurvy, hemoglobinemia, leucocythemia) specific fevers, malaria, cholera.
3. *Toxic.* Turpentine, cantharides.
4. *Neurotic or vicarious.* Hysteria, insanity, asthma, menstruation, hemorrhoids.

*External injury* causes laceration of the kidney substance, which, if extensive, may call for extirpation of the organ; in most cases the wound heals, and recovery takes place. The diagnosis presents few difficulties, and the treatment must depend upon the amount of hemorrhage, which, if great, will cause a tumor in the flank from effusion into the neighboring tissues. The treatment must be rest, an ice-bag to the part, ergotin subcutaneously, and in the last resort extirpation.

*Movable kidney.* Closely connected with the foregoing are cases of persistent or intermittent hematuria dating from a blow or fall. It is supposed that the organ is partially displaced and rotated on its horizontal axis, so as to twist the vessel at the hilus, thus compressing the vein, and causing passive congestion.