of a small quantity of clear egg albumin which entraps them and carries them to the bottom of the centrifuge tube. The sediment is then examined by means of fixing and staining and cultivation, or by injection into guinea-pigs. Of the three methods the first two—viz., staining and cultivation—are rapid and accurate if properly performed by an expert. But they present many difficulties and liabilities to error, and cannot be carried through satisfactorily, except by a bacteriologist especially trained in the methods of distinguishing between the tubercle and the smegma bacillus. Koenig, Bunge, and many others have been led astray by the alleged discovery of the tubercle bacillus in urine. Hence, the guinea-pig test, though slow, is the appropriate one for all but the most skilled. The injection of sedimented urine and the post-mortem examination of the animal several weeks later require no special description here.

The ordinary staining methods by which the tubercle bacillus is readily distinguished in sputum do not avail to distinguish it from the smegma bacillus in the urine. A full exposition of the difficulties surrounding this work with an explanation of the means devised to overcome these difficulties is detailed by Sondern.[1] I have not attempted to employ these special methods myself, but I can vouch for the accurate results obtained by Dr. Sondern.

Other Symptoms.—Among the other symptoms due to tubercular cystitis a partial incontinence of urine from spasm or from ulceration of the neck of the bladder is notable. Mixed infection adds pyuria to the hematuria, and phosphatic stone may be formed and multiply the patient's agonies. The symptoms of involvement of the other genito-urinary organs are, sooner or later, important, and the rapid pulse, hectic fever, and general deterioration characteristic of this disease may be distinguished in advanced cases.

Diagnosis

Familiarity with the symptom-complex just laid down, together with the discovery of tubercular lesions elsewhere in the body, may be depended upon to establish the diagnosis in many cases. A family history of tuberculosis may also be elicited.

Differential Diagnosis.—The evident features about the disease, early or late, are bleeding and irritability. It may be confused with simple cystitis, stone, tumour, contracture of the neck of the bladder, and renal tuberculosis. From *simple cystitis* it is distinguished by the preponderance of hemorrhage and irritability, by the special antipathy of the tubercular bladder to nitrate of silver, by

[1] Jacobi Festschrift, 1900, p. 484.

the evidence of tuberculosis elsewhere in the body, and by the discovery of the tubercle bacillus in the urine. *Stone in the bladder* often gives rise to symptoms closely resembling tuberculosis; the searcher establishes the diagnosis. *Tumour* is not often confused with tuberculosis, but excessive irritability from the former, or excessive hemorrhage from the latter may make them seem very much akin. *Contracture of the neck of the bladder* may (pp. 317, 400), as we have seen, be either simple or tubercular. The symptoms of the two resemble each other so closely that one of our best-known genito-urinary surgeons habitually confounds them. Evidence of tuberculosis elsewhere in the body, or the discovery of the tubercle bacillus in the urine is absolutely essential to convict any one with a contracted vesical neck of being tubercular. *Renal tuberculosis* often gives symptoms purely referable to the bladder (p. 602). The cystoscope may be required for a diagnosis.

Method of Examination.—In the examination of a patient with tubercular cystitis the nature of the disease may be first suspected from the symptoms, the history, or the evidence of tuberculosis in the testicles, prostate, or lungs, or from the general tubercular aspect of the patient. If this is the case every effort should be made to establish the diagnosis without introducing any instrument into the bladder. This can often be done, and the patient's gratitude well earned. But if the surgeon inclines to operative treatment (which I do not), if there is question of stone or of renal lesion, or if the idea of tuberculosis does not cross the surgeon's mind, instruments may be employed. The use of any instrument in the tubercular bladder is likely to be followed by considerable prolonged spasm, which can be minimized only by gentleness. The searcher must be used (p. 436) if stone is suspected. The cystoscope I have employed but rarely. General anesthesia is usually required to overcome the vesical spasm and bleeding, and the diagnosis of renal tuberculosis can usually be made without cystoscopy. In only one condition is the cystoscope absolutely essential—viz., when removal of a tubercular kidney is contemplated. Cystoscopy is then essential to determine the condition of the bladder and permit catheterization of the opposite ureter (p. 472). It is notable that if the bladder lesion is confined to the neighbourhood of the ureteral mouth it will usually heal after nephrectomy, and is no contra-indication to the operation.

Urinary examination and detection of the tubercle bacillus are always part of the routine examination. I have employed the tuberculin test, but I consider the febrile reaction which it causes an unwarranted strain upon the system.

Prognosis

The course of the disease is irregular and slow. The symptoms grow worse year by year; but the disease may last a long time—I know of one man who is no worse now than he was twenty years ago, though he has had a violent tuberculosis of the bladder all that time—since it is not in itself fatal, though it may well render life unendurable. When death occurs this is due to renal or pulmonary involvement, and upon the implication of these vital organs depends the prognosis. Recovery is possible, though rare.

Treatment

Conservative treatment of tuberculosis of the bladder has given far better results than any of the radical procedures that have been employed. It must be the surgeon's aim to let the bladder entirely alone, if possible, and to confine his treatment to the climatic, hygienic, dietetic, and tonic treatment appropriate to tuberculosis of any organ. Whatever local or operative treatment has to be undertaken, hygiene is always the backbone of a cure. Among tonics, cod-liver oil, creosote, and guaiacol hold their accustomed places. Guyon favours an iodoform pill. Vaughan[1] and Chetwood have achieved cures by the use of nuclein in 5% solution hypodermically (3 grammes daily), by the stomach (4 grammes daily), and in the advanced stages as an intravesical injection (50% solution). I have had good results from ichthyol and ichthalbin administered internally. Balsamics and alkalies may be employed to modify the urine and to soothe the bladder. Urinary antiseptics are useless and likely to prove irritating.

Local Treatment.—In the early stages of the disease local treatment is absolutely contra-indicated. It only irritates the bladder and provokes ulceration of the tubercles.

When the disease is well advanced some treatment is usually necessary to control the vesical spasm. Local treatment is employed for this purpose, often with great success, but only according to certain well-defined rules. In the first place, gentleness is more essential here than in any other form of urinary disease. In the second place, irrigations must not be used. They are very badly borne by the sensitive bladder and do no more good than instillations. In the third place, nitrate of silver, boric acid, and permanganate of potash, so soothing to simple cystitis, cannot be employed in tubercular cystitis on account of the violent reaction they provoke even in very weak solution—this is especially true of the silver salts. Finally, the best rule for local treatment is to use the drug that gives the most comfort, regardless of any curative powers it may possess.

[1] Med. News, 1894, lxv, 657, 675.

The favourite topical applications of various authors may be briefly enumerated. Guyon employs corrosive sublimate, beginning at a strength of 1:20,000 and running up very slowly to 1:10,000 or 1:5,000, or to whatever strength is well borne. Collin employs the following:

℞	Pulv. iodoform	1 gramme
	Guaiacol	5 grammes
	Ol. oliv. steril	100 "

Chetwood has used 25% to 100% solutions of guaiacol valerianate in olive oil, and 3% to 12% watery solutions of thallin sulphate. Both Senn and Horwitz suggest trichlorid of iodin in 0.2% to 0.5% solution, and the former also employs the familiar 10% iodoform-glycerin emulsion. Cumston has employed lactic acid (5%).

Of all these remedies, the ones I have found most soothing are sublimate, guaiacol valerianate, and thallin. Of these, the former two are the more healing, but one is forced to use thallin when nothing else gives relief. The instillations should be repeated 2 or 3 times a week. Improvement is always slow, but when a local application is benefiting the patient he is quick to recognise the relief and hails it with delight.

Operative Treatment.—Hygiene and local treatment may fail—they often do. The indications for operation are: 1. To relieve symptoms by establishing continuous drainage and so allowing the bladder to rest. 2. To cure the disease by topical applications. 3. To remove the diseased tissue by cautery, curette, or knife. The last indication can seldom be acted upon. It is very rarely possible to remove all the diseased tissue, since the primary focus is usually in some adjacent organ and the oldest bladder lesions are about the trigone, where they can least well be excised. Moreover, an operative failure entails dire results. The patient may be relieved of his dysuria, but he is condemned to a permanent tubercular fistula. If the operation has been performed as a last resort, with this permanent fistulization in view, the patient may well be content to put up with it; but if he finds himself, without any warning, condemned for life to a foul fistula, a leg urinal, and a filthy bed, his gratitude to the surgeon will be slight indeed. Hence early operation is not indicated; there is too much to lose and too little chance of gain. It is generally conceded that operation is required only when local treatment has failed completely and the patient is unable to endure

his agony. Then the prospects may be clearly set before him: the slight chance of permanent cure, the possibility, the advantages and the disadvantages of permanent fistula. If the patient is willing to risk everything on the chance of improving his condition, the surgeon may then proceed with a clear conscience to do what he can.

The selection of operation must be left to the surgeon's judgment. If the patient is far gone with renal or pulmonary disease a simple suprapubic cystotomy (p. 459), with permanent drainage, will give the best results. It will suppress his pains at the cost of a continuous drainage—an exchange he is glad to make.

Apart from those ulcerations about the ureter that may be expected to disappear after nephrectomy (p. 608), there are two forms of tuberculosis that may demand operation while the patient is still in excellent health and before any signs of tuberculosis have been detected elsewhere in the body. The localized vesical tuberculosis may be disseminated more or less generally over the mucous membrane, or it may consist of an isolated process, commonly at or near the neck of the bladder. Under these circumstances, if the dysuria is quite uncontrollable, suprapubic or perineal cystotomy may be performed. Most surgeons prefer the suprapubic route, some the perineal. Once in the bladder the surgeon may be sorely tempted to excise or to scrape away the focus of disease. Extirpation of the whole mucous membrane has even been resorted to (Delagénière [1]), while such lesser operations as excision of an ulcer or cutting down the neck of the bladder are frequently performed. The results have been unalluring. In a few cases the excision of tubercular ulcerations has effected a cure, but in many the vesical tuberculosis has relapsed and the spread of the disease in other organs has been unchecked. Any interference with a tubercular vesical neck is likely to result most disastrously in permanent incontinence, and perhaps in permanent tubercular perineal fistula. Dr. Chetwood has obtained rather more encouraging results with his perineal galvano-cauterization, but the method is as yet experimental in this respect. On the whole, an attempt to extirpate an isolated tubercular focus in the mucous membrane of the bladder may be successful, but the chances are strongly against it.

On the other hand, excellent results have been obtained by medication of the bladder through the suprapubic wound. The bladder may be irrigated daily with the iodoform, guaiacol, or sublimate solutions described above. The result may be disappointing, yet such treatment often alleviates the symptoms and may effect a cure.

[1] Guyon's Annales, 1896, xiv, 59.

SIMPLE ULCER OF THE BLADDER

There are five kinds of vesical ulcers:

1. **Tubercular Ulcers.**
2. **Malignant Ulcers.**
3. **Inflammatory Ulcerations.**—These have no clinical significance. They consist of exfoliations and superficial exulcerations of the mucous membrane occurring in the course of an acute or a chronic cystitis.
4. **Traumatic Ulcers.**—These result from stone or are post-partum complications. The bladder wall having been crushed during parturition by forceps or by the child's head, a part of it may slough away.
5. **Simple Ulcers.**—These ulcers, known also as idiopathic, embolic, and perforating ulcers, are met with from time to time. Bartleet,[1] Wyeth,[2] and Johnston [3] have reported cases, and Güterbock [4] mentions the subject; but Hurry Fenwick [5] has considered the subject most intimately. While confessing the extreme infrequency of the condition, and admitting that it can only be distinguished from tubercular ulceration by the absence of tubercle bacilli from the urine (a perilous criterion), the absence of any other evidence of tubercular disease, and the ultimate recovery of the patient (though a tubercular ulcer may heal spontaneously), he maintains, nevertheless, that the simple ulcer of the bladder is a distinct clinical entity. "There is usually only one ulcer. . . . Its size rarely exceeds that of a shilling, and its situation is nearly always to the inner side of the ureteric orifice. . . . It usually affects the tissues of the posterior wall and does not actually encroach upon the trigone." Fenwick compares this ulcer to the simple ulcer of the stomach, and mentions one case of perforation.

The *symptoms* are comparable to those of tuberculosis; but the pains are alleviated by all forms of irrigation, instead of being made worse. The *prognosis* is good. A *cure* may be effected by curetting.

[1] Lancet, 1876, i, 210.
[2] N. Y. Med. J., 1892, lv, 582.
[3] Brit. Med. J., 1893, i, 1003.
[4] Die Krankheiten der Harnblase, 1890, p. 375.
[5] Brit. Med. J., 1896, i, 1133; also Ulceration of the Bladder, London, 1900.