opsonic index, in connection with these reactions, may give valuable information concerning their nature.

(7) That the nontoxic residue of the typhoid bacillus as prepared by Professor Vaughan seems to make the typhoid process longer, but milder. As stated above, it is apparently very effective in the prevention of relapses.

MODERN OPERATIONS FOR COMPLETE REMOVAL OF THE PROSTATE.

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At the present time two methods of complete prostatectomy are being urged by earnest advocates: one is the suprapubic method and the other the perineal; both of these methods usually permit of thorough removal of the prostate. The choice between them should be based on the relative mortality of the operation, the quickness of recovery, and upon the degree of restoration of function obtained by each.

In order to decide these points and make a wise selection between these operations, it is, therefore, important to assemble statistics which shall give us reliable data, both as to mortality and as to after condition. Something is also to be said in regard to the technical difficulties which surround each operation.

I operated first by the suprapubic route, because it was an easy method of approach to the gland, requiring but little dissection. Since, however, I began to use the perineal operation I have gradually used it more and more, and I now find that I regard it as the method of choice, and I apply it to every case in which the removal of the prostate is the prime object of the operation. This change of practice has come about because I have found that although it takes a somewhat longer dissection to reach the prostate by the perineal route, the opportunity for accurate inspection and exact operative procedure is so much better as to wholly outweigh the added difficulties of the dissection. Some operators consider it of no consequence whether the prostatic urethra is torn much or little during the operation. The fact that good results are obtained when all of the urethra within the prostate is torn out with the gland leads many to think that it matters little what happens to the prostatic urethra, anyway. I cannot share this view, for I believe that when the prostatic urethra is for the most part preserved in its proper relations, not only is the healing and restoration of the parts more speedy but the chance of satisfactory restoration of function is more sure. Young has cited facts to show the retention of sexual power when the utricle and seminal ducts are spared. I believe that the restoration of satisfactory urination is more sure when the prostatic urethra has not been seriously torn.

One cause for lack of success in complete prostatectomy has been from the formation of flaps of mucous membrane which have afterwards acted as

valves to hinder urination. These flaps form in two places: at the vesical outlet and at the apex of the prostate where it joins the membranous urethra. If the prostate is enucleated from above, the mucous membrane is broken through with the finger at the vesical outlet and through this opening the gland is stripped out. Working from above downwards, it must not infrequently happen that a portion of the urethra towards the apex of the prostate is left, while the portion of the urethra towards the bladder is thoroughly removed. This part of the urethra which is left projects back into the cavity from which the prostate has been shelled out. It forms, as it were, a cuff. It may be readily seen that with the current of urine flowing down from above, this cuff of mucous membrane, by folding from side to side, may readily close the opening of the urethra from an obstructing valve. Operating through the perineum with a wide incision, which allows the parts to be brought into view, the various steps of the operation are under the guidance of the eye, and the difficulties above described are easily avoided. The enucleating finger, entering at the apex of the prostate, separates the gland from its outer capsule, then from the vesical side, and lastly strips it off from the urethra. This separation of the gland from the urethra is done from within outwards, can be assisted by the scissors and blunt dissector and preserves the urethral wall for the most part.

Up to this stage of the operation the only damage done to the urethra has been the opening through which the tractor was introduced, and usually some tearing of its floor. The roof of the urethra is left intact. There is no cuff of mucous membrane which can roll in and form a valve. In a difficult case when the urethral wall is torn more than is usual the rent is so disposed that any flap that is formed is attached about the orifice of the bladder so that the urine as it flows out does not double it up in front of the stream but rather washes it out flat and escapes by it. If now there is a third lobe which has a broad base, it can be readily removed through the cavity left by the removal of the lateral lobes. If a very prominent third lobe is peeled out without removing the mucous membrane covering it a large loose flap is left which may act as a valve and obstruct the vesical orifice just as the third lobe itself did. When there is a pedunculated third lobe I prefer, therefore, to pull it out from the urethra and to cut it off with the thermocautery, removing its mucous membrane with it. In some cases there are several projections into the bladder, all of which can be dealt with in the same manner. By cutting off these pedunculated outgrowths *in toto* we avoid the formation of flaps of mucous membrane, which may afterwards act as valves. The vesical opening left after the removal of the lateral lobes is ample for the handling of a good-sized third lobe. I have found the lithotomy scoop a useful instrument in pulling down these projecting growths and have never been seriously hampered by want of room to properly deal with them.

Diagrammatic drawing, showing above, a flap of mucous membrane left by shelling out a prominent third lobe, and below, a remnant of the urethral mucous membrane extending back into the cavity from which the prostate has been removed — either of which would tend to form a valvular closure of the urethra.

Three times in the past three years I have encountered small obstructing prostates which could not be enucleated. One of these I approached from above, and finding a bar at the neck of the bladder I cut and cauterized it as deeply as seemed safe with so small a prostate. This operation was followed by but little improvement. The other two cases I treated by perineal prostatectomy. Finding that the glands would not peel out I cut them out piecemeal with rongeur forceps and then with a finger as a guide in the bladder I cut away the bar, bit by bit, till nothing was left but soft mucous membrane. In both of these cases the restoration of urination was thoroughly good.

My personal experience then has been that the restoration of function is more complete and lasting after the perineal than after the suprapubic operation. The control of hemorrhage I have found distinctly easier by the perineal route. A strip of gauze can be snugly packed into the prostatic capsule and then the end can be brought down through the outer wound which it should not fill tightly, for too much pressure against the rectal wall may produce sloughing and lead to a fistula. In the suprapubic operation it is difficult to apply packing so that it will stay in place and continue to exert pressure against the bleeding surface without so filling the base of the bladder as to exert injurious pressure on the ureters and to cause great discomfort to the patient. In one case of suprapubic prostatectomy I had great difficulty in controlling the hemorrhage, and lost my patient owing, as I thought, to the interference with the kidneys caused by the tight packing. Convalescence after perineal prostatectomy is much quicker and more comfortable than after the suprapubic operation. The tubes can be removed on the third to the fifth day, and after this the patient soon passes his own water with little or no involuntary leakage. At first the larger part of the water comes through the perineal wound and serves the good purpose of keeping this thoroughly washed out. Occasionally, for a few days, the urine comes away involuntarily through the perineal wound. This soon ceases, however, and usually, by the end of a fortnight, the greater part of the urine is passed *per urethram* with little or no escape through the perineum. It has happened in one or two of my cases that after taking out the tubes the patient has been unable to void the urine. In these cases the catheter is easily introduced through the urethra and drainage kept up for a few days in this manner, at the end of which time the power of voluntary urination has been invariably restored. In some few cases the patients preferred to have the catheter retained till the tenth or twelfth day on account of the comfort of keeping the dressings dry. The in-lying catheter does not interfere with getting the patients out of bed, and it is our practice to get them up as soon as possible, for they seem to do better when moving about.

Mortality.—In the past four years I have operated on thirty-five cases by perineal prostatectomy. Two cases have died; one three days after operation, the other at the end of a month,

The histories of these two fatal cases are as follows:

CASE 14. E. F. S., aged seventy-seven, entered the hospital March 26, 1905, with a history that he had been for ten years troubled with frequent urination.

Four weeks before entrance he began to feel as if he did not empty the bladder.

Three weeks ago the urine stopped. He then resorted to the catheter, which has been used ever since.

Two days ago he began to have difficulty in using the catheter and he has now gone fourteen hours without having any urine drawn.

The greatly distended bladder was emptied and constant drainage was instituted.

At the time of entrance the urine was 1,027 specific gravity and showed a trace of sugar. Quantity of urine was only 19 oz. in the first twenty-four hours; the next twenty-four hours it rose to 35 oz.; and six days after entrance it rose in twenty-four hours to 85 oz., falling back, however, to 55 and 42 on the following days.

The patient was troubled with bronchitis of a chronic nature. Operation was put off in the hopes of somewhat improving this condition. However, his condition was so uncomfortable and manifestly getting worse that operation was undertaken on April 11.

In cutting into the prostate, considerable pus escaped and was pressed out during the subsequent enucleation.

The patient made a good recovery from ether, but on the following day the temperature rose to 101° and at night reached 103°. The quantity of urine in that twenty-four hours was 20 oz. and the specific gravity 1,018.

On the 13th of April, the temperature remaining up, the patient showed cyanosis, and râles were found at the base. The quantity of urine in this twenty-four hours rose to 40 oz. and contained 1.3% sugar.

On the 14th the patient became unconscious. The quantity of urine rose to 90 oz., with 3% sugar, and having a specific gravity of 1,028.

The patient died in the afternoon, and unfortunately an autopsy could not be obtained.

CASE 15. P. P., aged sixty-one, entered the hospital April 10, 1905.

At time of entrance the patient was stupid and urine was tinged with blood. Patient said that he had always urinated well till five weeks ago, when he was seized with acute retention and catheterized. Since that time he has dribbled his urine in small quantities, with an occasional catheterization.

At the time of entrance the bladder extended above the umbilicus and the catheter introduced drew 40 oz. without emptying the bladder. Three hours later 20 oz. were drawn and in the evening of that day he was placed on constant drainage.

Two days after entrance the quantity of urine was 100 oz. in the twenty-four hours, specific gravity being 1,010.

On April 20 perineal prostatectomy was done, following which he passed 100 oz. of urine, with a specific gravity of 1,017.

After this the quantity of urine fell till, on April 24, it was 50 oz. in twenty-four hours, with a specific gravity of 1,018.

He now became flighty in his mind, pulled out his tube, and had a catheter introduced through the urethra. He was gotten out of bed, thinking that this might improve his condition, but, although the quantity of urine became fairly good, he gradually became more and more feeble and died on May 18, one month after operation.

NO.	AGE.	NAME.	RESIDENCE.	DURATION.	AMT. OF OBSTRUCTION.
1	64	E.	Medford, Mass. Hospital case.	3 years.	Catheterized himself every 4 hours.
2	73	C.	Everett, Mass. Hospital case.	3 weeks.	Depends entirely on catheter since first attack.
3	56	S.	Amesbury, Mass. Hospital case.	7 years.	Depends on catheter entirely. Litholapaxy 3 days before operation.
4	54	N.	Dover, Mass. Hospital case.	7 years.	For 2 years urine dribbled. Bladder distended to umbilicus.
5	65	M.	Boston, Mass. Private case.	1 year.	Residual, 8 oz. in 1903. Later depended wholly on catheter.
6	68	C.	Haverhill, Mass. Hospital case.	2 years.	2 years ago frequency every 3 hours, now every 10 or 15 minutes.
7	71	H.	Milford, N. H. Private case.	3 years.	Frequency 21 times in 24 hours. Bladder distended above umbilicus.
8	72	L.	Cambridge, Mass. Hospital case.	Few weeks.	April 23 abdomen distended to umbilicus; 83 oz. drawn by catheter. Constant drainage.
9	53	V.	Cambridge, Mass. Hospital case.	11 years.	For 6 months used catheter once a day. Residual, 15½ oz.
10	71	R.	Haverhill, Mass. Hospital case.	12 years.	Urinate every hour or less in day, 1 to 3 hours at night.
11	57	F.	Haverhill, Mass. Hospital case.	2 months.	11 days ago stoppage. Since, catheter twice a day.
12	65	G.	Hospital case.	8 years.	Glycosuric. Past month dependent on catheter. Ten days ago could not introduce catheter. Constant drainage.
13	60	G.	East Dedham, Mass. Hospital case.	10 years.	Occasional use of catheter for retention. Entirely last two months.
14	77	S.	Hyannisport, Mass. Hospital case.	10 years.	Dependent on catheter for past 3 weeks.
15	61	P.	Roxbury, Mass. Hospital case.	5 weeks.	5 weeks ago acute retention. Catheter several times since. Abdomen much distended.
16	64	C.	Cambridgeport, Mass. Hospital case.	5-6 years.	Uses catheter 3 times daily.
17	78	H.	Haverhill, Mass. Hospital case.	10 years.	Suprapubic operation in 1897. Has used catheter for two years.
18	64	C.	Boston, Mass. Private case.	16 years.	Occasional use of catheter. Residual, 1½ oz.
19	62	P.	Hudson, N. H. Private case.	15 years.	For year used catheter 1-3 times at night, once in day.
20	69	M.	Rockland, Mass. Private case.	10 years.	Residual, 3 oz.
21	61	C.	Harwich, Mass. Hospital case.	7-8 years.	Acute retention 2 days ago. Bladder distended from umbilicus to pubes.
22		S.	Boston, Mass. Private case.	Many years.	Stream always sluggish. Recently almost stopped: after recovery, residual, 8 oz.
23	66	A.	Dorchester, Mass. Private case.	6 years.	Residual, 3½ oz. Urinate once an hour in day, only twice at night.
24	60	S.	Cambridge, Mass. Hospital case.	1 year.	April 13 stoppage; 50 oz. by catheter. Catheter most of time since. Residual, 8 oz.
25		F.	Peabody, Mass. Private case.	2 years.	Increasing frequency and difficulty in urination. Worse past 6 weeks, requiring catheter.
26	64	W.	Waltham, Mass. Private case.	3 years.	Residual, 3 oz. Frequency, every hour or two during day.

DATE OF OP.	RESULT.	PATHOLOGY.	CONDITION AFTER RECOVERY.
Feb., 1904.	Recovered.	Glandular hypertrophy.	Six months later urinates every 3-4 hours. "Feels a new man." No residual. March, 1905, same report.
Feb., 1904.	Recovered.	Glandular hypertrophy.	March, 1905, all urine per urethra. Residual, 2 dr.
Feb., 1904.	Recovered.	Hypertrophy of glands.	March, 1905, no residual. Better than for 20 years. Perfect control.
March, 1904.	Recovered.	Glandular hypertrophy.	One month later no residual.
March, 1904.	Recovered.	Diffuse hypertrophy. Small prostate.	In 1907, good health. Passes all urine naturally. Residual in 1906, 2 dr.
April, 1904.	Recovered.	Glandular hypertrophy.	May, 1905, very well since operation.
May, 1904.	Recovered.	Glandular hypertrophy with cystic dilatation.	Four months later residual 2-2½ oz.
May, 1904.	Recovered.	Glandular and cystic hyperplasia.	Urination restored. At first residual, 17 oz.; one month later fell to 5 oz. At that time used catheter once a day.
May, 1904.	Recovered.	Simple hypertrophy.	One month later passing urine with very little pain. Residual, 4-6 oz.
May, 1904.	Recovered.	Glandular hypertrophy.	Last of July better than for years. No residual. June, 1905, much improved. Perfect control.
June, 1904.	Recovered.	Glandular hypertrophy.	Seen in September. Very well. Urination normal. June, 1905, symptoms all relieved.
Feb., 1905.	Recovered.	Chronic glandular hypertrophy.	April, 1906, well since operation. Urinates every 4 hours, once at night. Residual, 2½ oz. Sugar intermittent, now quite 1%.
Feb., 1905.	Recovered.	Glandular hypertrophy.	Calculi removed. March, 1906. No difficulty. "Never felt better." M. G. H.
April, 1905.	Died.	Glandular hypertrophy.	Sugar found in small amount. Passes 90 oz. urine. No autopsy. M. G. H.
April, 1905.	Died.	Glandular hypertrophy.	Died one month later of pneumonia. M. G. H.
June, 1905.	Recovered.	Adenoma.	Jan., 1907, died of heart failure. "Had no trouble with urination since operation." M. G. H.
Oct., 1905.	Recovered.	Cystic adenoma.	M. G. H.
Nov., 1905.	Recovered.	Glandular hypertrophy with retention cysts.	Jan., 1906, felt well. Urinates every 1½-2½ hours. Residual, ½ oz.
Dec., 1905.	Recovered.	Adenoma.	July 30, 1905, ½ oz. "Feels 100% better since operation."
Jan., 1906.	Recovered.	Adeno-fibroma with cystic formation.	No residual.
April, 1906.	Recovered.	Cystic adenoma.	One month after operation residual, ½ oz.
April, 1906.	Recovered.	Glandular hypertrophy.	Urination normal. No residual.
April, 1906.	Recovered.	Glandular hypertrophy.	June 23. No residual.
May, 1906.	Recovered.		
June, 1906.	Recovered.	Glandular hypertrophy.	June, 1907. Urinates 4 times in day, once at night. "Feels like a boy."
Nov., 1906.	Recovered.	Cysto-adenoma.	No residual. Reported in June, feeling very well, with no discomfort whatever about urination.

NO.	AGE.	NAME.	RESIDENCE.	DURATION.	AMT. OF OBSTRUCTION.
27		P.	Brighton, Mass. Private case.	3 years.	Residual, 2 oz. Urinates with difficulty every 2 hours. Several attacks of inflammation with great discomfort.
28	70	L.	Brighton, Mass. Private case.		For 20 years slowness of stream. Of late worse, and required catheter twice a day. Residual, 30 oz.
29	75	O.	Neponset, Mass. Private case.	4 years.	Wears a catheter all the time.
30		W.	Peabody, Mass. Private case.		One year plus; frequency every hour. Residual, 15 oz.
31		F.	Westboro, Mass. Private case.	5 years.	Residual, 2-4 oz. Used catheter occasionally.
32	72	H.	Maine. Private case.	15 years.	For past 2 years used catheter chiefly. Residual, 12 oz.
33	65	W.	Wellesley Farms, Mass. Private case.	10 years.	Suprapubic in 1899. Difficulty returned until dependent on catheter, using 8 times in 24 hours.
34	65	C.	Brookline, Mass. Private case.	6 years.	Bladder difficulty, catarrh, etc. Catheter twice a day.
35		W.	Tyngsboro, Mass. Private case.	About 2 years.	Increasing difficulty and occasional retention, requiring catheter.
36		F.	Worcester, Mass. Private case.	4 years.	Gradually increasing slowness of stream. Never pain or frequency. Lately catheter twice a day. Residual, 25 oz.

The symptoms in this case were somewhat difficult to understand, and a neurologist who saw him in consultation thought that his condition indicated a previous apoplectic seizure, which had left some mental deterioration.

Case 14. The first of these patients with chronic bronchitis and glycosuria well illustrates the condition of broken health in which many of these patients come to the surgeon.

Case 15 did not die as an immediate effect of the operation but from some toxemia, as I thought, originally, due to the obstruction in the prostate with its secondary effects on the kidneys. In both cases, however, the operation failed to keep them alive and they should be rated in the mortality risk.

They give a death-rate of 5.5% in this small series of cases. This is somewhat higher than the mortality rate in the statistics of some operators, and higher, I believe, than the normal risk of the operation. I have now had 21 successive recoveries due in part, doubtless, to increased skill in operation and to experience in after-treatment.

Young reports 60 successive cases without a death. In no one of the 33 cases that recovered was there a failure to restore the power of voluntary urination, and in no case was there incontinence. In one case (case 8) the bladder was distended by 83 oz. of urine when he came under treatment. At first, after operation, the residual urine was 17 oz., it had fallen to 5 oz. one month later. He was then lost sight of. He had been freed from the constant thralldom of the catheter,

but found its occasional use of advantage in keeping the bladder clean. Case 9 had a residuum of 15½ oz. before operation, and one month after operation was passing urine with a little discomfort and had a residual urine of from 4 to 6 oz.; he was then lost sight of. It is to be remembered that in many cases of prostatectomy the full measure of improvement is not reached for several months.

From these cases and from others I have received the impression that a certain proportion of these patients, whose bladders have been long distended, lose the expulsive force to such a degree that they are afterwards unable to completely void the urine even when the obstruction is wholly removed. This is due not only to the induced atony of the walls but also to the sacculation which forces portions of the mucous membrane out between the muscular bundles so that the sacculi have no contractile tissue in their walls and so are unable to empty themselves when the bladder closes down.

It remains to speak of my experience with rectal injury, which is constantly urged as an opprobrium of the perineal operation. In case 5 the vigorous traction of a retractor tore a rent about an inch long, transversely, across the rectal wall. It was closed with a double row of chromic gut stitches and healed by first intention without causing any trouble. Since that experience I have always covered the rectum with the end of a gauze sponge and have found this a perfect protection. In case 17, an old and broken man of seventy-eight, who had had a partial prostatectomy by the suprapubic route eight years before,

DATE OF OP.	RESULT.	PATHOLOGY.	CONDITION AFTER RECOVERY.
Nov., 1906.	Recovered.	Glandular hyperplasia with retention cysts.	Seen in June, 1907. Was perfectly well. Passing water normally. Regarded himself as greatly benefited by operation.
Nov., 1906.	Recovered.	Glandular hyperplasia with retention cysts.	In excellent health. Free and comfortable urination, 5 or 6 times in 24 hours.
Dec., 1906.	Recovered.	Glandular hypertrophy.	June, 1907. Urination easy and comfortable, 5 times in day, 3 at night. Has gained weight; in good health.
Jan., 1907.	Recovered.	Glandular hyperplasia with cystic dilatation.	In good health.
Jan., 1907.	Recovered.	Glandular hyperplasia.	
Feb., 1907.	Recovered.	Glandular hypertrophy.	April. Holds urine 6 hours. Feels better than for years.
March, 1907.	Recovered.	Glandular and fibrous hypertrophy.	April. Residual, 3½ oz. Urination every 2 hours in day, twice at night.
March, 1907.	Recovered.	Glandular and fibrous hypertrophy.	April. Residual, 3 oz.
March, 1907.	Recovered.	Glandular hypertrophy.	June, 1907. No difficulty in urination. No frequency in day, once in night.
June, 1907.	Recovered.	Glandular hypertrophy.	

was greatly troubled by a persistent suprapubic fistula. For six years he passed water unsatisfactorily by the natural efforts, but for two years he had returned to the use of the catheter. In the hope of relief from his fistula he decided upon further operation. The effect of the former operation seemed to have been to fix the prostate rather high in the pelvis so that it was more than usually difficult to reach from the perineum. The hemorrhage was no more than it often is, but the already feeble condition of the patient caused apprehension on this score, and after he was in bed an extra gauze was packed into the outer wound. The pressure of this led to a slough in the rectal wall which caused a fistula that was slow to heal and greatly prolonged the convalescence. Voluntary urination was re-established and the suprapubic fistula closed, but there continued to be a considerable leakage into the rectum. In both of these cases the injury to the rectum was due to lack of experience on my part and in both cases the difficulty was preventable.

Preparatory treatment. — It often happens that these patients reach the surgeon in a condition very unfavorable for operation. The two fatal cases illustrate this. Other cases which seemed equally unfavorable were so improved by preparatory treatment as to bear the operation perfectly. Case 25 was an example of a severe cystitis with probably pyelonephritis and certainly uremia, who required one month of preparation before operation could be safely undertaken.

CASE 25. Mr. F., sixty-three years of age. Seen by me May 11, 1906. For two years he had had in-

creasing frequency and difficulty in urination. Six weeks before I saw him the difficulty of urination had greatly increased and required the constant use of a catheter. For several days he had had fever and nausea. He was of feeble muscular development though he had had but little illness during his life. Examination showed him to be mentally confused, with a feeble, irregular pulse, a dry, brown tongue, anorexia and persistent nausea. The bladder could be felt moderately distended and the prostate was smoothly and evenly enlarged. The catheter passed easily and drew about a pint of very cloudy urine and at the end about 2 oz. of pus flowed out. The catheter was fastened in for constant drainage. Liquid diet with as much water as he could comfortably take. First twenty-four hours, 60 oz. of urine, much clearer than had been drawn at entrance. Specific gravity 1,008, albumin trace, urea 19 gm. The urine quickly increased in amount up to 120 oz., and his power of taking food improved, but slight occasional nausea with a dry tongue persisted for a long time. Finally, at the end of a month, during most of which time the amount of urine had remained above 100 oz., the tongue cleared off, the pulse became steady at about 70 and perineal prostatectomy was done.

Pathological report: Glandular hypertrophy with retention cysts.

Convalescence was slow but steady. This patient was up in five days but the wound healed very slowly. Reported in November: "Passes water four times in day, once in night." "Feels like a boy." Case 12 was an instance of glycosuria which was so improved by treatment that a prostatectomy was well borne.

The accompanying table gives the essential details of this series of cases.