ON SUPRA-PUBIC LITHOTOMY.

BY

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THE high or supra-pubic operation for stone in the bladder has had a singular history. Its first performance may perhaps date from the second century, but the earliest reliable case is that of Pierre Franco who, in 1561, thus succeeded, after the failure of some other method (probably "on the grip") in extracting a large stone from the bladder of a child. The patient recovered easily. Franco, however, ends his account of the case by saying, "I do not advise any man to do the like."¹

Nevertheless in 1590 Rosset published a remarkable, and for the period a very advanced essay on this subject, which was unjustly blamed and criticised by Hildanus in 1682. Other writers, notably John Douglas,² described this operation, but it obtained no repute until Cheselden took it up in 1722, during which year he cut "nine patients this way." They were of various ages, from four to nineteen years. Two died, one of renal calculus,

¹ Pierre Franco, 'Traité des hernies,' p. 139, Lyons, 1561.

² 'Lithotomia Douglassiana,' 1723.

there being renal calculus and abscess, the other of some fever, either fortuitous or pyæmic. But the histories record one after another the ease and comfort of the patient, together with the facility of recovery. Yet Cheselden, who about this time was emulous of the success obtained by an imitator of Frère Jacques (Rau, of Amsterdam) abandoned the high for a perineal operation, and soon after perfected the manner now known as "lateral." Since that time the supra-pubic method has only been resorted to when the stone has been diagnosed as very large. It may, however, well be doubted whether surgeons are right in regarding the high operation as one only to be used in exceptional cases, and indeed since 1851, when Günther published his well-known work,¹ there seems to be some disposition to reconsider the question.

My thoughts were more especially led in this direction by a rapid sequence in my clinic of cases of vesico-vaginal fistula. I had under my care in seven months (the latter part of 1883 and beginning of 1884) three cases of this affection, all originating in the extraction of calculi during infancy and youth by different surgeons. Such fistulæ are very recalcitrant to treatment by operation, for they lie in the midst of hard, thick cicatricial tissue. The bladder is much diminished in capacity. In two of the cases the fistulæ were very high, and in the thickened state of parts the uterus could not be drawn down.² I do not know how or why these cases should have all come under my notice in such rapid succession, but they made a great impression on my mind, and I determined that when any female child came under my care with a stone too large and

¹ 'Der hohe Steinschnitt,' Leipzig, 1851.

² One of these women, aged nineteen, I succeeded after two operations in curing; another, aged twenty-four, had been thrice subjected to operation before I saw her. I gave a guarded prognosis concerning the result of any fresh attempt and have not seen her since. One is incurable, the fistula lying close to the os uteri, which, in the almost cartilaginous hardness of parts, cannot be brought down. She is approaching the menopause; when that occurs I shall occlude the vagina.

hard to be extracted per urethram either whole or in fragments, it should be taken out above the pubes.

CASE 1.—Rose A—, æt. 9, came under my care on 6th February, 1885.

No history was obtainable. The parents simply left the child and did not come again.

She was greatly emaciated and exceedingly fretful. During both night and day she had to micturate very frequently, suffering greatly in doing so. A good deal of urine came away involuntarily, or at all events not restrained. The urine was alkaline, sp. gr. 1019, pale and opalescent from slight admixture of mucus. A little albuminous cloud appeared on boiling. There was a deposit (quarter of glass) which consisted in part of amorphous powder, but very largely of oxalate of lime, chiefly in octahedral crystals.

When a sound was passed into the bladder it immediately impinged on a large stone; if the instrument was pressed further in the same direction a little urine flowed, as though the calculus acted as a valve over the urethral exit; but by a little manœuvring the instrument could be made to pass behind the stone. Examination per rectum revealed little, a good thickness of soft structures intervening between the finger and the stone. Vaginal examination showed that the calculus occupied nearly all the breadth of the pubes and reached a good way upwards.

February 12th.—The child was placed under the influence of ether. A further examination caused me to conclude that the stone was even larger than it at first seemed. About $3\frac{1}{2}$ oz. of carbolized water was injected, when percussion gave dull notes to rather less than half way to the umbilicus. Requesting my assistant to place a finger in the vagina to steady the stone forwards, and at the same time to compress the urethra against the pubes to prevent any outflow of urine, I made an incision about three inches long strictly in the middle line, and after twisting two small vessels, divided the linea alba, taking

care to cut from above downwards. The recti and pyramidales were held apart by broad retractors ; but the peritoneum was not in view.

The peculiarly soft yielding tissue which lies between the bladder and the abdominal wall was now divided, and the bladder punctured ; when a little water had oozed from the bladder it was opened in a downward direction to the extent of about two inches. The stone thus laid bare was gripped in a small pair of straight lithotomy forceps. They slipped twice, but on the third attempt the calculus was brought about half way out of the bladder. The edges of the recti, however, held it, and the linea alba was therefore divided a little further in an upward direction with a probe-pointed bistoury, superficial to the peritoneum, and the stone was easily extracted. It weighs $2\frac{1}{4}$ oz. minus 5 gr. ; that deficit would be more than out-balanced by the chipping from its upper end. Its length is $2\frac{1}{4}$, one short diameter $1\frac{1}{2}$, the other short diameter $1\frac{1}{4}$ inches.

As the bladder contracted and emptied itself the anterior fold of peritoneum slowly descended and came into view.

The cavity examined by the finger was found free from any fragments or detritus ; the incision was closed with four catgut sutures. Three quill sutures were passed through the whole thickness of the abdominal wall, bringing together the upper five sixths of the wound ; a good-sized drainage-tube was placed behind the recti and protruded at the lower corner of the incision, the skin was sewn with wire, and a catheter passed per urethram.

13th.—Passed a very good night. Temp. 99° pulse 100. The dressings were found sopped with urine ; none passed by the catheter. The lowest superficial stitch removed, a larger tube passed. A larger catheter (winged) substituted.

14th.—Removed the deep sutures ; wound closed except where the drain enters.

It would answer no purpose to follow out the daily notes of this case. The child had no pain nor any

trouble; her peevishness and fretfulness entirely passed away, and after the second day she became joyous and laughter loving.

26th.—Urine ceased to come by the wound, the dressing remaining dry; nevertheless I thought it wise to retain the catheter a little longer.

March 4th.—Removed drainage-tube and catheter. The child is well and has gained flesh very considerably.

The operation was performed under the carbolic spray, and the wound was dressed always with the same precautions.

CASE 2.—William W—, æt. 60, came into Charing Cross Hospital under my care 20th April, 1885, with frequent and painful micturition. The man was weakly, looking older than his stated age, and said that in consequence of having to pass water frequently he had but little sleep.

I passed a sound and immediately detected a stone. The bladder felt somewhat roughened, but the prostate was very large. Although the whole manipulation was very gentle considerable hæmaturia followed and continued for sixty-three hours.

24th.—I injected the bladder and measured the stone. I succeeded in obtaining three diameters, viz. $1\frac{2}{16}$, $\frac{13}{16}$ and $\frac{7}{16}$ inch respectively. Again hæmaturia continued for some days and the man suffered a good deal after micturition. In consequence of this condition and of the large size of the prostate, I determined to perform the high operation, to prepare him for which I caused a flexible catheter to be passed daily and the bladder to be injected with a solution of carbolic acid one in sixty until a sense of distension was experienced.

30th.—When the patient was under the influence of ether the bladder was slowly filled with 16 oz. of the same solution. The catheter was plugged and a broad piece of tape tied round the penis. Notwithstanding the amount of fluid in the bladder, percussion gave clear notes down to, or very nearly down to, the pubes.

I made an incision three inches long in the middle line from above downwards and cautiously divided the *linea alba* and *fascia transversalis*. This fascia, the recti and the skin, were held apart by two broad retractors, and now placing my forefinger on the front of the bladder I pushed up the fold of the peritoneum, placed upon it a broad retractor, and confided it to Mr. Cantlie, who was assisting me. I met with no resistance whatever in thus pushing upward the peritoneum; it glided quite smoothly and easily from the anterior face of the bladder. The prevesical fat was now incised; two veins required ligature. With the edge of the knife directed downwards I made a small opening in the bladder as high as seemed desirable and placed a blunt hook in it to prevent the organ, as it emptied itself, from sinking into the pelvis; then with successive touches of the knife, the bladder was incised. The attached surface of the mucous lining was marked with large distended veins. Most of these were avoided, but two had to be tied, and three arteries in the thickness of the vesical wall were twisted. The organ was laid open to the extent of about two inches. I passed in my fore and middle fingers, and, gripping the stone between them, easily removed it. The wall of the bladder still oozed, and I was reluctantly obliged to apply a hæmostatic (one part of *Liq. Ferri perchloridi* to six of water). After this the bladder and other parts were sewn up and treated as in the former case.

May 1st.—The patient passed a good night, almost entirely free from pain. Temp. 99.2° . Urine came by the wound, which was perfectly healthy; it was syringed out with carbolic acid solution. A larger catheter (the one passed yesterday having become plugged) was introduced.

2nd.—Quill suture removed, wound healed except at site of drainage-tube.

4th.—Some small shreds of sloughed tissue stained with the perchloride came away. The man has had no pain nor fever.

10th.—All the wound has been healed for the last three

days save an opening that might perhaps admit an ordinary cedar pencil through which some urine flowed, though by far the largest part came by the catheter.

17th.—The opening above the pubes much smaller. He complained of some soreness in the urethra, probably produced by the catheter. This was removed on the 15th. To-day he passed urine by the urethra. The fluid, as usual in these cases, caused a good deal of scalding.

He went out quite well in the middle of July.

On 24th March, 1886, I received a note from Dr. Hughes, of Deal, who sent me this last patient, from which the following is quoted: "The old man, William W—, for whom you performed supra-pubic lithotomy, is in robust health and able to do a good day's work."

Remarks.—I would direct attention to the ease and facility with which these patients recovered, reminding the Society that this is especially the characteristic of Cheselden's, Petersen's, Günther's and other patients. My first case, the little girl, had no pain or trouble from the hour of operation. In my second case the fistula lasted some weeks. The man was somewhat troubled in mind on this account, although I was able to assure him that the opening would close within a moderate interval, which in fact it did.

The objections urged against the high operation are found, on examination, to be untenable or exaggerated. They are these:

1. The danger of wounding the peritoneum.
2. The danger of urine collecting and putrefying in the wound.
3. The danger of establishing a urinary fistula.
4. The fear that the bladder may become adherent to the abdominal wall and that thus its function may be impaired.

I propose to examine the first of these objections at the end of this communication, since it involves many points in the method of operating, in the preparation of the patient and certain matters regarding the position of the peritoneum in different states of the bladder and rectum.

These I, as well as certain other surgeons, have made the subject of experiments recorded in an appendix.

We pass on to the second objection,—the fear that urine may collect and putrefy in the wound, and with that subject we may consider the after-treatment.

Fresh urine that is not ammoniacal does no harm to a recent wound; on the contrary it is a non-irritating irrigation; and I submit that by careful use of antiseptics we can prevent it becoming ammoniacal in all parts accessible to an injection. Now, the peritoneum on the bladder leaves uncovered a triangular surface, bounded on each side by the hypogastric arteries to which it is firmly attached. This space, when the organ is distended, is (in the adult) from two to three inches long and a little more than an inch wide at its base; but when the bladder contracts it becomes very small, and as urine cannot pass beyond the lateral boundaries, all implicated parts in a properly conducted operation are perfectly within reach of an injected fluid.

But it may be questioned whether the after-treatment I adopted is the best. Such cases have been dressed in every possible manner. By T-shaped drainage-tubes and by simple meshes of hemp introduced through the wound into the unsewn bladder and with only the upper edge of the skin wound sewn; by no dressing at all save wool or tow to absorb the urine; by position, namely, on the side a little turned to the front, and many others; I do not find that the statistics of one method have any advantage over the others; yet it appears to me that by suturing the whole thickness of the abdominal wall one probably diminishes whatever tendency there may be to a subsequent hernia. Also it would seem that by stitching the bladder a more rapid healing must follow; indeed in three out of his four cases, Petersen procured primary union.

Günther says¹ that a catheter passed per urethram prolongs recovery. Other surgeons doubt this assertion.

The danger of establishing a urinary fistula need hardly

¹ 'Der hohe Steinschnitt,' p. 80, Leipzig, 1851.

detain us; such mishap has never, I believe, occurred. My case, No. 2, is an instance of the longest duration of such a fistula, viz. eleven weeks. It is doubtless a long period for recovery from lithotomy; but knowing as I do the state of this man's bladder and prostate, as also his weak and senile condition, I conceive that he recovered quite as quickly as he would have done from a lateral lithotomy, and that he ran infinitely less risk of not recovering at all.

The danger that the bladder may lose the power of emptying itself by becoming adherent to the abdominal wall was disproved by Cheselden in these words¹: "Joseph Reynolds, who was cut May the twenty-second, 1722, and discharged cured, in the beginning of July, was about the middle of October following taken ill of a fever, with violent vomitings, of which he died in a few days, having enjoyed perfect health from the time of his cure to this illness. I opened him, and found his kidneys and bladder free from any disorder, and the wound in the bladder united with a firm, smooth cicatrix, the outside of the wound being joined to the wound made through the integuments, it was perfectly empty of water, which shows this connection of the bladder to the integuments was not inconvenient on that account; and not only this patient, but all others have been able to contain as much urine in their bladders at once, as persons that have not been cut."

The danger of wounding the peritoneum has been very much exaggerated. I am, of course, aware that this mishap has occurred to certain operators; yet my experience on the living, and my numerous experiments on the dead, subject cause me unhesitatingly to say that such misfortune can always be avoided.

The height above the upper edge of the os pubis at which the lower margin of this membrane in front of the bladder lies, varies somewhat in different individuals, even with pelvic organs equally full or empty. In chil-

¹ 'A Treatise on the High Operation for Stone,' by William Cheselden, 1723, p. 20.

dren it is practically out of the way, as in my case of Rose A— (see also Appendix).

In some adults when both bladder and rectum are empty, this fold lies a line—occasionally even two lines—below the upper margin of the pubes; but it more commonly lies above, even considerably above, that bone; but wherever it may be while the bladder is empty, it always rises when from 6 to 16 oz. of fluid are injected, and that to a height quite compatible with a safe high lithotomy.

A device for pushing up the bladder still further, namely, distension of the rectum with an india-rubber bag, was devised and practised by Dr. Petersen, of Kiel,¹ It may be granted that when the true pelvis becomes thus forcibly occupied by a foreign body, the bladder will to some extent be extruded, a change which as Dr. Garson² has shown can only take place by stretching—even to double its length—of the prostatic urethra; a process which can hardly be free from danger in elderly persons.

But I am able to state from a series of experiments, in twelve only of which were perfectly accurate measurements taken, (see Appendix), that distension of the rectum makes but very little difference in the position of this peritoneal fold; never more than a quarter of an inch, oftener an eighth of an inch, and sometimes its elevation was barely perceptible.

I fear I must also say that Dr. Petersen must have been misled in his experiments by a faulty method of procedure. A glance at his table will show this, since he assigns to this fold a position which is anatomically impossible. Out of ten cases there were seven in which this fold is stated to lie at two finger-breadths, and in one case at three finger-breadths below the pubes, that is to say at least one and a half and two and a quarter inches respectively.

This slight influence of rectal distension is confirmed by Dr. Garson's experiments. Table II, p. 356 is a copy

¹ 'Langenbeck's Archiv,' vol. xxv, p. 752.

² 'Edinburgh Medical Journal,' Oct., 1878.

of all that part of his table which refers to this fold of peritoneum. The important portions are cases 1, 2, 3, and 6, 7, 8. Nos. 1 and 6 have the same amount in the bladder; in the former the rectum is full, in the latter empty; yet the peritoneal fold lies in both at the same level. Such is also the condition in Nos. 2 and 7, and again this fold lies at precisely the same height; while in No. 8, with a like amount in the bladder, but with an empty and contracted rectum, this fold lies six tenths of an inch higher than in any case in which the rectum is full.

My own experiments, twelve in number, are added in an appendix. In summing up their result I would say that I never found distension of the rectum raise the peritoneum more than a quarter of an inch, oftener only an eighth of an inch, and sometimes its elevation was barely appreciable; the conclusion being that distension of the rectum, though it may be dangerous, is useless in high lithotomy.

These facts being fixed, I may say a few words as to the mode of operating. A catheter should be first passed into the bladder; it may be either metallic or flexible. An operator with but little experience may prefer a metal one, as in a later stage it may serve as a guide to opening the bladder. Through the catheter the bladder is to be injected with such amount of an aseptic solution as previous experience shows the patient is able to bear. If a metal catheter be used it must be plugged; if a flexible one it must be removed; in either case if the patient be a male a fillet is to be tied round the penis; if a female a finger-tip introduced a little way *per vaginam* may be used to compress the urethra against the pubes, thus effectually preventing micturition; or, should it seem desirable to steady the stone, the tip of the finger may do so, while the front of the first or second phalanx will prevent escape of the injected fluid.

All incisions should be made from above downwards. To cut through the *linea alba* without opening the peritoneum is very easy, and is constantly done by all who

practise abdominal surgery. The fascia transversalis should be incised just above the pubes, and a director, kept close to its deep surface, passed from below upwards. The triangular interval left by the two sides of the peritoneal fold now comes into view ; the bladder being concealed by a layer of very soft fat. Should the interval not be large enough a mere touch of the finger will increase it ; the peritoneum lies on, without being attached to, this part of the bladder. The veins in the fat are easily seen and may as a rule be avoided.

The opening of the bladder is best begun above by a little quick thrust of the bistoury, and before carrying the incision further it is well to pass in a blunt hook behind the knife, thus obviating too rapid contraction and collapse of the organ into the pelvis.

When possible the stone should be removed with the fingers.

Were not this paper already, I fear, too long several other points might be discussed.

For female children, probably for females of all ages, whenever lithotomy is necessary the high operation is preferable to all other methods ; it is quite as safe and cannot lead to any form of urinary fistula.

Lateral lithotomy in boys gives excellent results when the stone is not large ; nor have I seen any of the evils alleged to result from division of the vas deferens within the prostate. I cannot, however, but think that any stone, large enough to render laceration of the prostate probable during its removal by the perineum, should be taken out above the pubes. The route to the bladder is shorter, through less important and vascular tissues, and there is no danger from hæmorrhage. The results obtained by Cheselden and by other more modern operators show the remarkable ease of recovery after a *sectio alba*.

For adult males the high operation is probably to be limited to stones of a certain size and to some cases of diseased prostate and bladder. I consider, however,

that the limit of size has been placed too high, and that a stone weighing 2 oz. is, unless amenable to lithotrity, most safely removed by the high operation. Save in a few very rare cases distension of the rectum is unnecessary. Should the peritoneum, when exposed, be found to lie very unusually low, the surgeon could introduce a bag per rectum if he deemed it desirable.

For tumours of the bladder, unless situated very close to the urethral orifice, high section of the bladder is especially indicated, and if such tumour lie at the back of the organ that portion may be advantageously raised and fixed by distension of the rectum.¹

APPENDIX.

The objects of this Appendix are—1st, to explain why the experiments herein detailed were made; 2nd, to explain the method of conducting them.

In studying the question of supra-pubic lithotomy a very important point is the position, in different states of the pelvic viscera, which may be assumed by that fold of peritoneum lying between the anterior abdominal wall and the bladder.

In 1880 Dr. Petersen, of Kiel, published an account of ten experiments made to ascertain the relative position of the anterior fold of the peritoneum and of the upper border of the os pubis. He proceeded thus. He made "an incision through the linea alba just below the umbilicus. The position of the prevesical peritoneal fold was then estimated by the introduction of a finger."²

It is only fair to add that Petersen acknowledges these measurements to be not quite certain (*nicht ganz sicher*).

¹ A plate was handed round showing a position employed by Trendelenburg (see '*Langenbeck's Archiv*,' Bd. 31, p. 514), and which the author of the present paper recommends as well adapted for exploration of the fundus of the bladder.

² "*Ueber Sectio alba*," '*Langenbeck's Archiv*,' vol. xxv, p. 757.

But I fear we must go further. The professor found that when both bladder and rectum were empty this fold lay in one case level with, in another one finger-breadth, in seven two, and in one three finger-breadths below the upper margin of the os pubis.¹ Now, the average of ten measurements of five finger-breadths (index and middle) is a little over an inch and a half.

The average of ten measurements of the depth of the pubes, or, in other words, of the length of the symphysis, is one and seven tenths of an inch. Therefore, according to these experiments the fold of peritoneum lay within two lines of the margin of the pubic arch.

Considering that, however contracted, the bladder must occupy more than two tenths of an inch behind the pubes, the condition of affairs thus described appeared to me impossible; more especially when Petersen gives one case in which the prevesical fold lay three finger-breadths, *i. e.* just over two and a quarter inches below the upper margin of the os pubis, I cannot but feel great doubt as to his results, more especially as Dr. Garson says that when the bladder and rectum are empty, the peritoneal fold usually lies a few millimetres *above* the margin of the pubes.

Dr. Garson² has also studied this question by personal experiment, and by measurements taken from engravings of frozen subjects in Pirogoff's and Braune's Atlases. In his conclusion No. 3, he says "that the raising of the peritoneum can also be produced by simple distension of the rectum." It is to be regretted that Dr. Garson gives no instance of this. His table of thirteen cases contains none in which the bladder is empty and the rectum full. Moreover with all the diffidence that I must feel in combating the conclusions of so eminent an authority, it must be stated that his results do not tally

¹ I subjoin a copy of his table, with French converted into English measures. I may add that the average distance of the internal orifice of the urethra is under two inches from the upper margin of the pubes.

² 'Edinburgh Medical Journal,' October, 1878.

TABLE I.—*Dr. Petersen's (Kiel) Table, the metric system being reduced to English measure.*

Bladder, contents of in drachms	Rectum, contents of bottle in.	1	2	3	4	5	6	7	8	9	10
0	0 oz. 7 " " 14 " " 21 " "	- 2 F. " " " " - 1 F.	- 0 F. " " +0.15 in. +0.27 in.	- 2 F. - 1½ F. - 1 F. - ½ F.	- 2 F. - 1½ F. - 1 F. - ½ F.	- 1 F. - ½ F. - ¼ F. - ¼ F.	- 2 F. - 1½ F. - 1 F. 0	- 2 F. - 1½ F. - 1 F. +0.23 in.	- 2 F. - 1 F. - ½ F. 0	- 2 F. - 1 F. - ½ F. 0	- 3 F. - 2½ F. - 2 F. - 1½ F.
7 oz.	0 oz. 7 " " 14 " " 21 " "	- 1 F. " " " " 0	+0.33 in. +0.43 in. +1.28 in. +1.7 in.	- 1½ F. " " - 1 F. 0 almost	- 1 F. - ½ F. 0 +0.039 in.	- ½ F. 0 +0.29 in. +0.54 in.	- 1½ F. - 1 F. 0 +0.03937 in.	- 1½ F. - 1½ F. - ½ F. 0	0 +0.11 in. +0.29 in. +0.59 in.	- 1½ F. - ½ F. 0 +0.15 in.	- 1½ F. - 1 F. 0 +0.25 in.
14 oz.	0 oz. 7 " " 14 " " 21 " "	0 0 +0.59 in. +1 in.	+0.87 in. +1.18 in. +1.85 in. +2.27 in.	- ½ F. " " " " +0.23 in.	- ½ F. 0 +0.039 in. +0.23 in.	+0.17 in. +0.54 in. +0.88 in. +1 in.	- 1 F. 0 +0.3937 in. +0.59 in.	- F. - ½ F. 0 +0.29 in.	+0.23 in. +0.54 in. +0.7 in. +1 in.	- ½ F. 0 +0.15 in. +0.24 in.	+0.1 in. +0.3 in. +0.5 in. +0.8 in.
21 oz.	0 oz. 7 " " 14 " " 21 " "	+0.33 in. +0.59 in. +1 in. +1.33 in.	+1.49 in. +1.8 in. +2.4 in. +2.5 in.	0 +0.12 in. +0.39 in. +0.87 in.	0 +0.039 in. +0.54 in. +1 in.	+0.669 in. +0.88 in. +1.18 in. +1.35 in.	+0.29 in. +0.3937 in. +0.7 in. +1 in.	- 1 F. 0 +0.29 in. +0.87 in.	+0.39 in. +0.7 in. +0.8 in. +1.3 in.	0 +0.12 in. +0.24 in. +0.59 in.	+0.6 in. +0.8 in. +1.2 in. +1.3 in.

with his deduction. Cases 1 and 2 have the bladder distended and have also the rectum "much distended." Now, in them the distance of this fold above the pubis is given as forty and fifty-five millimetres; but Case 3 with an equally full bladder, but with a rectum only "moderately distended," the distance is fifty millimetres *i. e.* two tenths of an inch less than Case 2, and four tenths more than Case 1. Evidently in these three cases rectal distension had no effect.

TABLE II.—*Garson's Table, the metric system being reduced to English measure.*

No. of case.	Condition of bladder.	Condition of rectum.	Distance of peritoneum above pubes.
1	Much distended ¹	Much distended ²	1·57 inch.
2	Fully distended	Fully distended	2·16 "
3	Much distended	Moderately distended	1·96 "
<i>Cases where Bladder and Rectum were empty.</i>			
4	Almost empty	Absolutely empty and contracted	0·19 inch.
5	Absolutely empty	Almost empty	0 "
<i>Cases with empty Rectum and distended Bladder.</i>			
6	Much distended	Absolutely empty and contracted	1·57 inch.
7	Distended	Empty and contracted	2·16 "
8	"	" "	2·75 "
9	Half filled	Empty	0·079 "
<i>Cases with moderately distended Bladder and Rectum.</i>			
10	Moderately full	Moderately full	0·3 inch.
11	Half full	Half full	0·79 "
12	Moderately full	Moderately full	0·62 "

¹ Bladder filled with 8 oz. 3 drs. (240 grammes of fluid.)

² Rectum distended by bag containing 10½ oz. (300 grammes) of fluid; its circumference being 9·84 inches (25 cm.).

Again, when we compare Cases 1, 2, and 3 with Cases 6, 7, and 8,¹ we find the following. The former series are, as stated, cases with distended bladder and rectum; the peritoneal fold lies forty, fifty-five, and fifty millimetres respectively above the pubes. Cases 6, 7, 8 have the bladder equally distended, the rectum "empty and contracted." The fold lies forty, fifty-five, and seventy millimetres above the pubes, that is on an average seven millimetres higher when the rectum is empty than when it is full. In the table subjoined I have reduced these measures to inches—seventy millimetres is two and three quarter inches, and this was obtained when the bladder was distended (not "much distended") and the rectum empty and contracted.

Surely these cases, 6, 7, 8, show, when compared with Cases 1, 2, and 3, that distension of the rectum has no effect on the anterior fold of the peritoneum.

Wishing to gain a definite insight into the true state of the case with regard to this fold I instituted a series of experiments the result of which is subjoined. They were conducted in the following manner:

The bladder was emptied by the catheter and the rectum by washing it out with water. An incision was then made through the *linea alba* and *fascia transversalis*. The position of the lower border of the prevesical fold was measured.

In Series I the bladder only was filled with varying amounts of water.

In Series II the bladder was filled first, then the rectum.²

In Series III the rectum was filled first and then the bladder; subsequently, while the bladder was still full, the rectum was emptied.

In each one of these different conditions the position of the fold was carefully noted.

¹ In Garson's table, Case 7, the particular point in question is not marked. I have therefore omitted it and changed (after 7) the numbering.

² By means of a distensible india-rubber bag and a Higginson's syringe.

TABLE III.—*Experiments (Barwell).*

Cases in which Bladder only was filled.

No.	Subject.	Age.	Bladder.	Rectum.	Relation of fold to pubes.
1	Child	2½	{ Empty 2 oz.	Empty "	¾ inch above 1¼ " "
2	Child	4	{ Empty 4 oz.	Empty "	½ inch above 1¼ " "
3	F.	62	{ Empty 8 oz. 16 oz.	Empty " "	½ inch below ¼ " above 2 " "
4	M.	39	{ Empty 10 oz. 16 oz.	Empty " "	½ inch above 1½ " " 2½ " "
5	M.	32	{ Empty 10 oz. 14 oz.	Empty " "	Level 1 inch above 1½ " "

In which Bladder was filled first, then Rectum.

6	M.	30	{ Empty 6 oz. 10 oz. 15 oz.	Empty " " "	½ inch above ¾ " " 1¼ " " 1½ " "
			{ Empty 6 oz. 10 oz. 15 oz.	12 oz. " " "	½ inch above 1 " " 1½ " " 2½ " "
			{ Empty 10 oz. 10 oz.	Empty " 10 oz.	½ inch above ¾ " " 1½ " "
			{ Empty 10 oz. 16 oz. 16 oz.	Empty " " 10 oz.	¾ inch above 1½ " " 2½ " " 2½ " "
			{ Empty 10 oz. 12 oz.	Empty " 12 oz.	Level 1½ inch above 1½ " "
			{ Empty 12 oz. 12 oz.	Empty " 12 oz.	Level 1½ inch above 1½ " "

In which Rectum was filled first, then Bladder.

No.	Subject.	Age.	Bladder.	Rectum.	Relation of fold to pubes.
10	M.	72	Empty	Empty	$\frac{1}{4}$ inch above
			"	8 oz.	$\frac{1}{4}$ " "
			8 oz.	8 oz.	1 " "
			16 oz.	8 oz.	$2\frac{1}{4}$ " "
			16 oz.	Empty	2 " "
11	Boy, immature and small	14	Empty	Empty	$\frac{5}{8}$ inch above
			"	6 oz.	$\frac{1}{2}$ " "
			2 oz.	6 oz.	$1\frac{1}{2}$ " "
			4 oz.	6 oz.	$2\frac{1}{16}$ " "
			4 oz.	3 oz.	$2\frac{1}{16}$ " "
			4 oz.	Empty	$1\frac{7}{8}$ " "
12	—	—	Empty	Empty	$\frac{1}{10}$ inch below
			"	10 oz.	Level
			10 oz.	10 oz.	$\frac{5}{8}$ inch above
			13 oz.	10 oz.	$1\frac{3}{8}$ " "
			16 oz.	10 oz.	$1\frac{1}{4}$ " "
			16 oz.	Empty	$1\frac{1}{2}$ " "

The conclusion seems inevitable that distension of the rectum produces no such elevation of the peritoneum as would be of any value to the operator, nor does it appear that there is any object to be gained in lithotomy by pressing forward the back of the bladder, as a stone, unless very small, is quite within reach. If cystotomy be performed for the removal of a growth the rectum should certainly be distended.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' New Series, vol. ii, p. 94.)