disappeared two to three weeks afterwards. In three cases of longer duration, although the injections relieved the pains the synovitis appeared to run its usual course. In one case of acute rheumatism with multiple synovitis and high temperature, while each injection was followed by a lowering of the temperature and relief of pain for some hours, no curative effect resulted, and the progress of the disease appeared to be unaltered. She had been given sodium salicylate up to the point of causing deafness and noises in the ears and sickness, without any relief of pain.

The technique is simple: a 1 gram tablet is dissolved in 10 c.cm. of distilled water by boiling in a test tube in order to ensure sterilization; the solution is then cooled and injected into the vein with a glass syringe. It is advisable to inject slowly to allow the solution to mix gradually with the blood stream in order to prevent thrombosis. I have now treated a diversity of painful conditions where other remedies have failed to bring alleviation. They include sciatica, acute rheumatism, tabes dorsalis, interstitial keratitis, acute iritis, gonorrhoeal synovitis, arsenical neuritis, dysmenorrhoea, and severe headache of doubtful causation. In all 55 cases have been treated. Pain is relieved in half to three-quarters of an hour and the effect persists for several hours and in some cases for days. In one case of acute rheumatism the patient was unable to take sodium salicylate and aspirin by the mouth on account of gastric irritation. Daily injections of 1 gram of calcium acetyl salicylate produced complete freedom from pain for about six hours. For adults the dose usually given is 1 gram.

In no case has there been the slightest ill effect. Following a personal experimental injection of 0.5 gram I noticed within a few seconds a slight acid taste in the saliva and two or three seconds later a sensation of flushing over the whole body with momentary slight tingling in the extremities. These symptoms, I think, are due to an alteration in the chemical reaction of the blood before the acid is neutralized. So far I believe I am justified in claiming that intravenous injection of calcium acetyl salicylate produces a greater and more immediate relief of pain than aspirin given by the mouth, and its administration is not harmful. It will act beneficially in many cases where other remedies have failed, and it can be repeated daily.

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EXTROVERSION OF THE BLADDER: THE SEQUEL TO TWO CASES.

BY

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In the BRITISH MEDICAL JOURNAL for April 28th, 1906,¹ were published some cases of extroversion of the bladder, in which a method of extraperitoneal implantation of the ureters into the rectum had been adopted. The first operation was performed on May 12th, 1899, and the method employed was original so far as we were concerned, and indeed has since been termed by Dr. Jaromir Jelinek of Brunn (Moravia) in his exhaustive pamphlet² the "London-Peters operation," the late Dr. Peters³ of Toronto having operated in a precisely similar manner in July, 1899. Dr. J. J. Buchanan⁴ of Pittsburg, however, points out that both Dr. Peters and ourselves were anticipated by Bergenhem (Sweden) in 1896, by Pozza (Italy) in 1897, and by Martin (U.S.A.) and Capello (Italy) in 1898. The operation should, therefore, properly be known as "Bergenhem's." As the two patients, whose cases were described at length, have recently died, it was thought that a brief account of their condition during the many years they survived, and of the *post-mortem* findings in one case, might be of interest.

CASE I (DR. LONDON'S).

In the case of this patient the operation was performed on May 12th, 1899, and he died on Christmas Eve, 1920, having thus survived over twenty-one years. The operation was performed when he was only 9 years of age, and as previous operations for the radical cure of large inguinal herniae had involved castration, he showed some of the characteristic features of a eunuch—namely, piping alto voice, hairless face, and childish countenance. He was broad and stout, his maximum weight was 8 st. 3 lb., and height 5 ft. 5½ in. when aged 23; other members of his family were much taller. He became a barber, a calling for which by temperament he seemed well fitted, and he continued to shave and amuse his customers till he was about 28 years of age.

He remained in perfectly good health for quite nine years after the operation (1899–1908), and he could always hold his water in the rectum all through the night. During the next ten years he had occasional bouts of illness, which included rigors, vomiting, pains in the loins and groins, and occasionally diarrhoea. The attacks were naturally attributed to uretero-pyelo-nephritis, and in confirmation of this idea there was at times some tenderness on palpating the right kidney.

About Christmas, 1918, his legs began to swell. The following January he contracted influenza. From that time forth he began to go downhill. In March, 1919, he got relief from multiple incisions into the dropsical limbs, and this treatment was repeated on three occasions. There was never any fluid found in the belly, but the right forearm towards the end was swollen, and when ill he was troubled with vomiting, but there were no other corroborative indications of uraemia.

He encountered a severe heat wave in December, 1920, and died on Christmas Eve. A very complete autopsy was performed by Dr. C. T. Turner, the urinary apparatus, together with the lower bowel, being removed *en bloc*, and the whole pelvis extracted.

Post-mortem Notes.

The only traces of the genital organs remaining were remnants of the crura of the penis. The bladder was replaced by scar tissue, behind which was some perivesical fat, and the fibrous structures which constituted a strong ligament between the separated halves of the pubes. (This has been well described by Professor Watson in one of our cases previously reported.⁵) The left kidney with its ureter was embedded all the way down in a dense mass of hard fat; it was a little difficult to find the kidney, and very difficult to trace the ureter. The kidney itself was much shrunken, tough, with wasted cortex (1 mm.), and dilated calyces filled with greenish-grey putty-like material. The ureter was 21 cm. in length and of varying calibre—the upper fifth the size of a slate pencil, the middle portion that of a lead pencil, whilst the lower end was strictured and kinked, becoming dilated again at its entry into the rectum on the left antero-lateral aspect, 5½ cm. above the anal margin. Its site was easily found in the rectum by a small polypoid projection.

The right kidney was a complete contrast. Its capsule peeled fairly readily, and its cortex measured 4 mm. There was some dilatation of the calyces, which were filled with semi-purulent material having the characteristic odour of the *Bacillus coli communis*. The right ureter was slightly dilated all the way down, and measured 6 mm. in diameter where it opened into the rectum, 8 cm. above the anus, where its gaping orifice admitted a No. 9 catheter.

Notes on the Pelvis, by PROFESSOR WOOD-JONES.

The pelvis (No. 1) is rearticulated after maceration. The sacro-sciatic notch may be described as ultra-masculine in type. The first three sacral elements remain ununited, and all epiphyseal lines are distinct. The epiphyses for the iliac crests and for the tuberosities of the ischia are separate. The backward rotation of the ilia is not nearly so well marked as in pelvis No. 2 (that of a girl aged 8), but the ilia are still more markedly upright. The sacrum is flattened from side to side and from above downward, but the loss of curvature is not nearly so marked as in pelvis No. 2. Three sacral elements articulate with the ilia, but the first element has been almost completely liberated from the articulation; the first coccygeal element has undergone sacralization. As in pelvis No. 2 there are joints between the laminae of the first two sacral vertebrae; the posterior arches of these two vertebrae are incomplete. The upper articular facets of the first sacral element are of the normal sacral type. The ischio-pubic ramus is slender, and the

large obturator foramen is almost vertical in its long axis. The pubic diastasis measures (in the rearticulated specimen) 31 mm. The distance from the anterior margin of the acetabulum to the free margin of the os pubis is equal to the diameter of the acetabulum.

The upward displacement of the sacrum relative to the pelvis has been noted in other specimens by Ballantyne. It is a very remarkable anomaly difficult to associate with the primary malformation. In pelvis No. 2 it has led only to an abnormally high position of the sacrum, and to the assumption of some definitely lumbar characteristics by the first sacral element. In this case it has led to the almost complete liberation of this bone.

Although the general deformity consists in a splaying apart of the two ilia, it is noteworthy that the pubic diastasis is exaggerated in both specimens by an absolute shortening of the pubis. Whereas in this specimen the horizontal ramus of the pubis measures 63 mm., in a normal male bone of very similar general dimensions it measures 76 mm. Associated anomalies consist in (a) general flattening of the sacrum, (b) peculiar slenderness of the ischio-pubic ramus, (c) general uprightness of the whole of the ossa innominata.

CASE II (DR. NEWLAND'S).

Apart from an attack of measles in 1914, he remained in good health from the date of the operation in 1904 down to the time of his final illness in 1920. He worked on the family farm, and during his brother's absence on active service he managed it. In September, 1920, he weighed 10 st., the heaviest he had ever been.

In October, 1920, he consulted Dr. L. G. Muirhead, of Henley Beach, complaining of general weakness, abdominal pain, and some cough without haemoptysis. No pulmonary or laryngeal condition could be detected. He had complete control over his urine and could pass it irrespective of the act of defaecation. The urine on examination was turbid and contained a good deal of albumin. The kidneys were neither tender nor enlarged.

On his return to the country he consulted Dr. G. H. B. Black, of Showtown, and was admitted to hospital on November 23rd, 1920, complaining of weakness, wasting, and occasional slight pain below the left costal margin. He had suffered from indigestion for several months, and from a cough for several weeks. He stated that occasionally he had difficulty for a day or so in holding the urine in the rectum for any length of time, but as a rule there was no incontinence. He was very wasted; the heart and vessels were natural. Slight pleural friction could be detected at the posterior base of the left lung. The kidneys were neither palpable nor tender. The healed scar of the old operation, in the pubic region, was partly covered with pubic hair. The penis was rudimentary. There was little hair on the face and the voice was falsetto. A filtered specimen of urine was free from sugar.

On December 2nd doubtful signs were detected at the apex of the right lung. On December 10th there were signs of a cavity in the same situation and tubercle bacilli were found in the sputum. A week later signs of consolidation developed in the lower lobe of the left lung. His general condition now rapidly deteriorated, and after an attack of "convulsions" he died on January 15th, 1921. An autopsy was not performed, and therefore no report on the condition of the kidneys is possible.

REMARKS.

The principal object of this paper is to encourage surgeons who may encounter these rare cases in future to operate upon the lines laid down in the communication referred to above,¹ for, if a child of 9, whose left ureter was noticed to be much thickened at the time of operation, can survive in comfort for about twenty years, and follow his occupation for eighteen years till disabled by cardiac dropsy, how much better results may reasonably be expected when clean cases are operated upon before the ascending ureteritis has set in. It would be interesting to learn the ultimate result of the cases reported in your columns by C. J. Bond,⁵ Gilbert Barling,⁷ Murray,⁸ Riddell,⁹ Lawford Knaggs,¹⁰ Rigby,¹¹ Ball,¹² Arumugum,¹³ Holman.¹⁴ Mr. Bond's case⁵ survived six years, according to a letter from him dated October, 1906, but this may be an error, as in his original report he gave the date of operation as 1903. Dr. Hatch, of Norwich, and formerly of Bombay, wrote of a successful case reported to the East Anglian Branch in 1904. The only cases we can find in recent Australian literature where this method was adopted are reported by Dr. Hamilton Russell, of Melbourne¹⁵: his three cases gave excellent results. Dr.

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Stewart McKay, of Sydney,¹⁶ planned an ingenious operation on the old lines of closing in the bladder: he introduced a tube of rectal mucous membrane into the bladder to avoid the ureteral orifices coming into contact with faeces.

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ON THE ESTIMATION OF THE PHYSIOLOGICAL COST OF MUSCULAR WORK :

THE SIGNIFICANCE OF THE RESPIRATORY QUOTIENT IN INDIRECT CALORIMETRY.

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In an article in this JOURNAL (May 21st, 1921, p. 733) Leonard Hill and Campbell show that in the estimation of the physiological cost of muscular work there is a lack of agreement between the results obtained by the method practised by Waller and De Decker¹ and that recommended by Cathcart. Waller and De Decker base their estimation on the exhalation of CO₂, 1 c.cm. of CO₂ being taken as equivalent to 5.856 calories. In the method described by Cathcart² the estimation is based on the absorption of oxygen, the caloric value of 1 c.cm. of oxygen varying with the respiratory quotient—that is, the ratio of the volume of CO₂ exhaled to the volume of oxygen absorbed during the same time. Leonard Hill and Campbell consider that two sources of error in the results of Waller and De Decker are (1) the short duration of the period of taking the sample, and (2) the failure to take sufficient account of the increase of metabolism due to taking food.

The source of error, however, which is inherent in Waller's method is the neglect of the significance of the respiratory quotient (R.Q.) in determining the caloric equivalent of the volume of CO₂ exhaled. According to Waller,³ one cubic centimetre of CO₂ is equivalent to 5.317 calories when the R.Q. is 0.95, and to 6.396 when the R.Q. is 0.75. In assuming a fixed R.Q. of 0.85, and a consequent constant value of 5.856 calories per cubic centimetre of CO₂, there is ample room for a wide error, even though the other source of error pointed out by Leonard Hill and Campbell were eliminated. On an uncontrolled diet the R.Q. is sometimes as high as 0.95 or as low as 0.75. On special diets it may fall outside these limits. Table I shows the extent of the error that may occur. The subject and the work—marching at 100 yards per minute on a level floor—were the same in both cases. The diet was uncontrolled.

TABLE I.—Showing Extent of Error.
Subject accustomed to apparatus (5 minute samples).

Date.	CO ₂ exhaled per minute.	Oxygen absorbed per minute.	R.Q.	Calories calculated from Oxygen Consumption Factor varying with R.Q.	Calories calculated from CO ₂ output, R.Q. assumed 0.85.
1919. Jan. 8	c.cm. 743	c.cm. 989	0.75	4.69	4.35
Jan. 9	865	960	0.90	4.73	5.07

The energy expenditure in the two cases as calculated from the exhalation of CO₂, assuming a constant R.Q. of 0.85, shows a difference of about 15 per cent., although the real expenditure as calculated by the more exact method differs by less than 1 per cent. The usefulness of this rapid method of estimating the physiological cost of muscular work by simply measuring the CO₂ output is