vol. lvi., p. 596, 1899. Pope, Campbell, Case of Gestation in one Horn of a Uterus Bicornis Unicollis, *Trans. Obst. Soc.*, vol. xxviii. p. 70. Remfry, Gestation in a Rudimentary Horn, *Ibid.*, vol. xxxvi. p. 263. Routh, Amand, *Ibid.*, vol. xxix. p. 2 (drawing of specimen, p. 58). Snegurieff, see Eberlin. Sutton, Bland, Hysterectomy as a Conservative Operation, *BRITISH MEDICAL JOURNAL*, April 8th, 1899, p. 839. Turner, Drawing referred to, copied in Hart and Barbour's *Manual of Gynecology*, under "Malformations." Veit, *Handbuch der Gynäkologie*, vol. i. Article, "Entwicklung und Entwicklungsfehler der weiblichen Genitalen," by Nagel. Zamschin, "Corne Uterine Embryonnaire Gravidé," *La Gynécologie*, April 15th, 1899, p. 164 (fourth pregnancy, foetal sac proved to be right cornu, good pedicle).

THE SOLVENT ACTION OF CERTAIN BRITISH AND FOREIGN MINERAL WATERS ON THE BIURATE OF SODIUM.

By WILLIAM BAIN, M.D., M.R.C.P.,

Harrogate.

[From the Physiological Laboratory, St. Thomas's Hospital, London.]

ADMITTING the therapeutical value of biurate solvents in cases of gout, it seems reasonable to test the solvent power of accredited remedies *in vitro*. Experimenting on these lines, Sir Wm. Roberts, and more recently Dr. Luff, found that the admixture of a small quantity of sodium salts with blood serum containing biurate diminished the solubility of the latter. Dealing with 100 c.cm. of distilled water containing an excess of biurate, it was shown that less biurate was dissolved in the presence of a sodium salt than in its absence. The inference drawn from these experiments was that mineral waters containing the smallest percentage of sodium salts were the most beneficial in the treatment of gout. There is, however, a consideration which makes it necessary to accept such an inference with caution. It should be remembered that mineral waters are not simple saline solutions, but may contain one or more substances counteracting the influence of the sodium salts on the solubility of the biurate. This objection is exemplified by the action in the laboratory of the mineral ash of spinach, as indicated by Dr. Luff, such ash being specially solvent, although its percentage of sodium salts is high. Dr. Luff, in his suggestive book, has given a list of mineral waters considered by him to be most suitable for the removal of the biurate deposited in the tissues in cases of gout, and has arranged them according to the proportion of sodium salts they contain.¹ To such a list this objection, if valid, must apply.

To test its validity I have carried out a series of experiments closely following the methods adopted by Dr. Luff:

The biurate of sodium was prepared in accordance with Sir William Roberts's instructions: 10 grams of uric acid and 10 grams of bicarbonate of sodium were added to a litre of distilled water. The mixture was boiled for half an hour, filtered, and the filtrate allowed to stand for twenty-four hours. The precipitate was then collected, washed with cold distilled water, and dried at 38° C.

In the first set of experiments six stoppered bottles, each having a capacity of 200 c.cm. were used, the size being important owing to the necessity for agitation.

No. 1 contained 100 c.cm. distilled water.

No. 2 contained 0.5 per cent. of a mineral water, plus 99.5 per cent. of distilled water.

No. 3 contained 1 per cent. of a mineral water, plus 99 per cent. of distilled water.

No. 4 contained 3 per cent. of a mineral water, plus 97 per cent. of distilled water.

No. 5 contained 5 per cent. of a mineral water, plus 95 per cent. of distilled water.

No. 6 control similar to No. 5.

An excess of biurate was added to the first five bottles. They were then placed in a warm chamber in pairs, at intervals of twenty minutes, and agitated an equal number of times; No. 6 was not agitated. The chamber was kept at a temperature of 38° C. by a gas regulator. When the door of the chamber was opened there was a temporary fall of about 2°. After a period of five hours the bottles were removed in the same order, the successive intervals being taken up by the processes of filtration and titration. Their contents were passed through double filters until clear solutions were obtained and refiltered; 50 c.cm. were then taken and made up to 100 c.cm. with distilled water. To this 20 c.cm. of sulphuric acid were added, and the mixture titrated with 1 in 10 normal standard permanganate solution.

In no two experiments did the distilled water dissolve exactly the same amount of biurate. This was anticipated, as it is next to impossible for the conditions to be precisely similar in any two of these experiments, but the variations lay within narrow limits. Proportionate variations in the same direction occurred with the mineral waters; that is to say in a given experiment when the result with distilled water was above the average, the result with the mineral water

was above the mean and *vice versa*; consequently the average of the figures obtained with distilled water has been taken as a basis and the other results brought into uniformity. Finding that the higher percentages of all the waters used diminished the solubility of the biurate, 1 per cent. has been selected as being the most appropriate for illustrative purposes. Objection may be raised to this percentage as being too high, but taking magnesia water as an example it should be noted that it only contains 2 per cent. of total solids, an amount reduced experimentally to 0.002 per cent.

TABLE I.—Showing the Solubility of Sodium Biurate in 100 c.cm. of Distilled Water, at a Temperature of 38° C., and in Distilled Water containing 1 per cent. of the different Mineral Waters.

Solvent.	Sodium Biurate Dissolved.
	Per 1,000.
Distilled water	1.110
Magnesia water, Harrogate	1.100
Beckwithshaw water, Harrogate	1.080
St. Ann's well, Buxton	1.075
Source Pavillon, Contrexéville	1.068
Teplitz	1.060
Celestin spring, Vichy	1.050
Mild Montpellier, Harrogate	1.020
Morrison well, Strathpeffer	1.010

It should be stated that the quantity of permanganate solution required to produce the end reaction in a control experiment was deducted in due proportion from the amount reduced in the titration process of the experiments with 1 per cent. of the different mineral waters before the figures in the above table were computed.

Several experiments were undertaken to determine the effect of agitation upon the solubility of the biurate. Considering what a very insoluble substance biurate is, the influence of agitation was very marked. Providing the temperature did not vary, it was found that as much biurate was dissolved in five hours with frequent agitation as in ninety-three hours without agitation.

In a second series of experiments distilled water was replaced by artificial blood serum which reacts with biurate similarly to natural blood serum. One per cent. only of the waters was experimented with and the bottles were left in the warm chamber for 20 hours, otherwise the experimental conditions were similar in the two series. A bottle containing artificial blood serum alone was always placed with each set of bottles in the warm chamber. As the artificial blood serum nearly always varied slightly in its solvent effect in the different experiments the average has been again taken, and the solvent power of each mineral water estimated accordingly. The results obtained with this medium showed even less comparative variation in the solvent power of the mineral waters used than with distilled water. With both media most of the experiments were repeated.

TABLE II.—Showing the Solubility of Sodium Biurate at a Temperature of 38° C. in 100 c.cm. of Artificial Blood Serum, and in Artificial Blood Serum containing 1 per cent. of the undermentioned Mineral Waters.

Solvent.	Sodium Biurate Dissolved.
	Per 1,000.
Artificial blood serum	0.104
Magnesia, Harrogate	0.102
Beckwithshaw, Harrogate	0.100
St. Ann's Well, Buxton	"
Sulis Water, Bath	"
Royat	"
Source Pavillon, Contrexéville	"
Elizabeth Brunnen, Homburg	"
Gichtwasser, Wiesbaden	"
Vittel	"
Ems	"
Teplitz	0.099
Bakocz, Kissingen	"
Celestin Spring, Vichy	"
Choussy-Perrière, La Bourboule	0.097
Marienbad	"
Morrison Well, Strathpeffer	0.096
Carlsbad	"

Regarding the therapeutic significance of these results, I may point out that the differences in solvent power between the various waters is almost infinitesimal, and that in any case the differences in question are not necessarily determined by the percentage of sodium salts they contain. The method itself, however, appears to me to be open to criticism. In the first place, the absence of continuous and prolonged agitation involves a marked divergence from the conditions under which the solvents would be present in the blood; and secondly, the chemical compounds that come into contact with the biurate in the test bottle are by no means necessarily identical with those that after absorption come into contact with it in the tissues. In illustration of this point, it may be stated that spinach was given in a case of chronic gout, the patient being at the time on a fixed diet, without any apparent effect on the solubility of the biurate, as evidenced by the excretion of uric acid in the urine. Hence inferences from chemical experiments, such as those under consideration, as to the activity of a supposed biurate solvent, should be modified by administering the substance to a gouty patient, and only when a positive result is obtained can a favourable conclusion be arrived at in regard to its therapeutic value.

REFERENCE.

1 A. P. Luff, *Gout: its Pathology and Treatment*, p. 230.

BONE CROCHET HOOK ($4\frac{1}{2}$ INCHES LONG) ACCIDENTALLY LODGED WITHIN THE PERITONEAL CAVITY.*

By HENRY BRIGGS, M.B. EDIN., F.R.C.S. ENG.,

Professor of Midwifery and Gynaecology in University College and Surgeon to the Hospital for Women, Liverpool.

THE total number of intraperitoneal foreign bodies to which any clinical interest has been attached has been small. This is due chiefly to two sets of circumstances. Within the opened abdomen the easy concealment of a sponge or instrument is ever present in the minds of the operating surgeon and his assistants. In the closed abdomen the anatomical relations of the peritoneal folds and the abdominal viscera do not encourage foreign bodies which may be lying, primarily, in the alimentary or genital canal to become, secondarily, wholly intraperitoneal. Nevertheless, sponges and instruments have been left behind by operating surgeons; and knives and the handle of a broken utensil, primarily swallowed, have by ulceration become, secondarily, wholly intraperitoneal. The former has supplied by far the larger group of cases. Reports, gathered from patients and communicated by correspondents to the medical journals, have suggested that instruments have been frequently used *per vaginam* by women upon themselves.

As an example of an almost singular risk of self-conducted vaginal manipulation of instruments, I have to report a case, recently under my care, at the Hospital for Women, in which a bone crochet hook was forced completely through the vaginal roof into the peritoneal cavity.

History.—A domestic servant, a single woman, aged 34, in service in Manchester, went home to stay with her mother at Runcorn. Next morning, Tuesday, March 7th, 1899, she "applied iodoform ointment to the ulcerated neck of her womb." For this purpose she used a single bone crochet hook, holding the hooked end in her right hand, and passing into the vagina the blunted end covered with the ointment. She had often before applied the ointment in this way. She always assumed during the process a squatting posture. On the occasion just referred to, when the crochet hook was within

further notice of the occurrence. There was not even a stain of blood, she said, until the next menstrual period commenced two days later, after the regular monthly interval, and ceased as usual the following day. She felt pain in the right iliac region on walking, and more particularly on sitting. She walked to Dr. Robinson's house in Runcorn on the Thursday; he advised her to go to the Hospital for Women, Liverpool. She delayed her journey till the Friday afternoon. On admission she complained of a little pain in the lower abdomen and of painful micturition.

Physical Signs.—There was no constitutional disturbance; the temperature and pulse were normal; she moved about in bed without obvious discomfort. Abdomen free from distension. Externally, tenderness and a local resistance, on pressure, under the inner fifth of Poupart's ligament, on the right of the pubes, suggested the site of one end of the crochet hook. Bimanually, the crochet hook could be traced, rather indefinitely, across the top of the right broad ligament, from the inner end of the right crural canal in front to the right fourth sacral foramen behind. At this stage of the investigation the patient was interrogated as to the length of the crochet hook. A crochet hook of the usual length (my charge-nurse had one) would not lie in a pelvis of average size in the position indicated. The patient explained that her crochet hook was shorter than the one nurse produced.

X-rays.—There were good reasons for the expectation that an x-ray photograph would confirm the presence and position of the foreign body within the pelvis. Dr. Thurstan Holland obtained the excellent result copied in the figure; a nurse's crochet hook, as a control experiment, was also photographed on the edge of the plate (see the figure).

Diagnosis.—I communicated the result of my clinical examination to Dr. Thurstan Holland before, at my request, he confirmed the diagnosis by an x-ray photograph, and added the useful information that the hooked-end of the crochet hook was most probably directed backwards, against the sacrum.

Operation.—March 14th (eight days after the accident), with the patient in the lithotomy position, I incised the vaginal roof, through the posterior fornix, and placed my left index finger within the pouch of Douglas, and on the hooked end of the crochet hook. My finger was used as a guide for a single tenaculum which "hooked" hook to hook, the hooked end, and enabled me to at once withdraw the crochet hook. A little serum, approximately 1 ounce, containing floccules of lymph, escaped. The opening in the vaginal roof was left lightly packed with cyanide gauze for forty-eight hours. A normal pulse and a normal temperature were recorded throughout the uncomplicated recovery. She left the hospital for home on March 27th.

Remarks.—The rectum, uterus, and bladder were explored and found empty, or unconnected with the foreign body. The crochet hook lay within the peritoneal cavity. How did it get there? I did not detect traces of an aperture of entrance.

Crochet hook (half size).

the vagina, she, from the squatting posture, reached over towards the top of a table close by. She afterwards knelt down, and immediately, on passing the finger well into the vagina, discovered that she could only just touch, and could not grasp, the hooked end of the crochet hook. She stood up and walked about, and, from her sensations, felt sure the position of the crochet hook within her was changed. She postponed

* Read before the North Wales Branch of the British Medical Association.