

THORIUM—A NEW AGENT FOR PYELOGRAPHY

PRELIMINARY REPORT

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In order that a solution may be ideally suited for use in pyelography, it must fulfil the following conditions: It should be nontoxic, nonirritating, and quite fluid, so as immediately to escape from ureters and bladder, and present the greatest possible degree of opacity to the Roentgen ray, casting not only a good shadow but also one of clear delineation.

Various colloidal solutions of salts of the heavy metals such as iron, silver, bismuth, copper and lead, and suspensions of the salts of bismuth, calcium and

Roentgen ray. This solution also inhibits, but does not prevent the growth of ordinary bacteria. It flows readily, owing to its lack of viscosity, and escapes immediately from a ureteral catheter when injected into the pelvis of the kidney, or can be voided immediately if used in the bladder. It is perfectly clear to

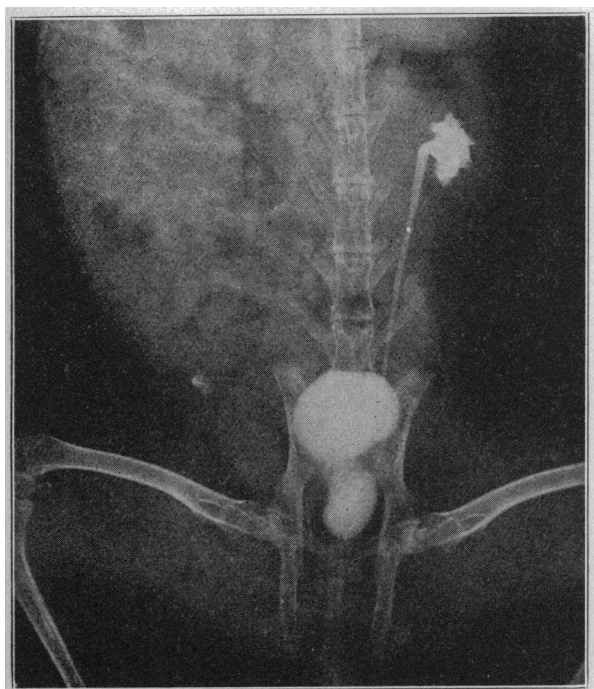


Fig. 1.—Rabbit's ureter and pelvis of kidney injected with 50 per cent. solution of thorium nitrate in distilled water.

magnesium have been tried. All of these solutions sediment on standing, and while being, for the most part, quite opaque to the Roentgen ray, are viscous, and some are quite toxic and irritating.

Thorium nitrate dissolves readily in water, giving a clear, markedly acid solution, which, while being opaque to the Roentgen ray, is unsuitable for use because of its being an irritant, possessing a marked degree of astringency, and precipitating insoluble salts in the urine. This solution cannot be injected intravenously into animals because it causes intravascular clotting.

The neutral solution of thorium nitrate and sodium citrate, however, about to be considered, possesses, as far as observations made at the present show, all of the previously mentioned salient characteristics for use in pyelography. In this solution there seems to be a complex ion formation which changes both the chemical and pharmacologic action without causing any decrease of the opacity of the solution to the

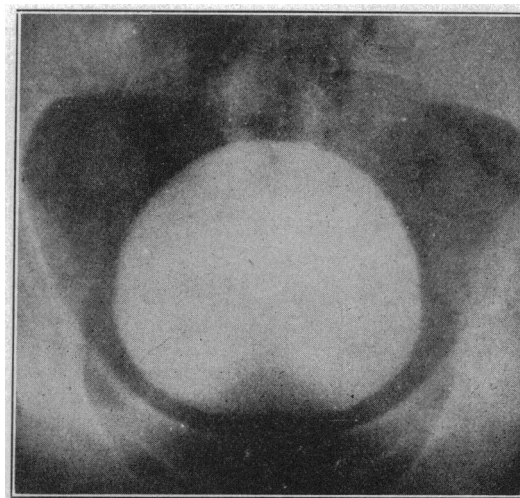


Fig. 2.—Normal bladder shadow. The bladder of this patient was injected with 350 c.c. of a 10 per cent. neutral solution of thorium nitrate and sodium citrate. Cystoscopic examination seventy-two hours after injection showed the bladder picture to be the same as before injection. The patient experienced no discomfort after the injection, nor were there any signs of irritation.



Fig. 3.—Trabeculated bladder with dilated internal sphincter, bilateral hydro-ureters and hydronephrosis due to congenital obstruction in the posterior urethra in a boy, aged 12 years. In this case, 600 c.c. of a 10 per cent. neutral solution of thorium nitrate and sodium citrate were allowed to flow in by gravity through a urethral catheter, the patient being in the Trendelenburg position while the picture was being taken. Cystoscopic examination, five days after the injection, showed the bladder picture to be the same as before injection. Phenolsulphonephthalein output and blood urea estimation were the same as before the injection. There were no signs of any irritative action.

transmitted light, possessing a faint, yellowish tinge in large volume. It is perfectly clean and does not stain the clothing. From an economical standpoint, it

has a decided advantage, being much cheaper than any of the silver preparations used at present, which are very expensive, particularly if used in quantities sufficient for bladder pictures and large hydronephroses. These preparations are also objectionable because they stain the clothing, have such viscosity as to make

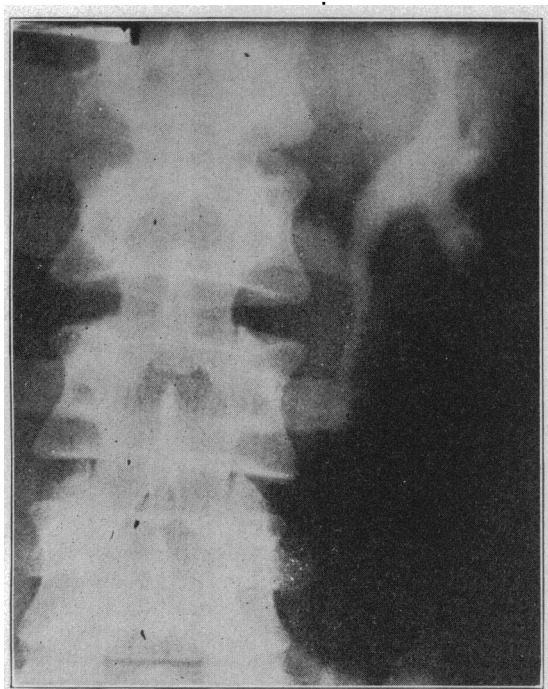


Fig. 4.—Renal pelvis and ureter. Seven and five-tenths c.c. of a 15 per cent. neutral solution of thorium nitrate and sodium citrate were allowed to flow into the pelvis of the kidney by gravity through a ureteral catheter. The phenolsulphonephthalein output was unaffected by injection; the solution caused no signs of any irritative action.

injections through a small catheter difficult, are very irritating when they escape into the tissues, and have, as a matter of fact, been followed by death in several instances.

The solutions used contain 10 per cent. and 15 per cent. thorium nitrate and are made in the following way:

To make 100 c.c. of a 10 per cent. solution, 10 gm. of thorium nitrate are dissolved in as little distilled water as possible; to this solution, kept hot on a water or steam bath, are added 30 c.c. of a 50 per cent. solution of sodium citrate, the additions being made in small quantities and care being taken to shake the solution thoroughly after each addition. At first after the addition of the citrate solution, a white gummy precipitate is formed which later becomes granular, and finally dissolves on the addition of all the citrate solution. This solution is then made neutral to litmus by the careful addition of a normal solution of sodium hydroxid, and made up to the required volume of 100 c.c. with distilled water. On filtration, a clear, limpid solution is obtained, which, when sterilized, either by boiling or steam under pressure, is ready for use. The stability of the solution is not affected in the least by sterilization.

The neutral solution of thorium nitrate and sodium citrate, prepared as directed above, is not irritating to the mucous membranes or peritoneal surfaces, does not precipitate salts in the urine, and can be injected intravenously up to 1.5 c.c. per kilogram of body weight and given by stomach up to 4 c.c. per kilogram of body weight in dogs without causing any change in the phenolsulphonephthalein output, blood urea content, hemoglobin content or cellular elements of the

blood. No gastro-intestinal symptoms have been observed in any of these animals up to the present time. Complete protocols of these animals and further studies in regard to its pharmacologic action will be published in a subsequent paper. This solution may also be used in the roentgenographic study of the gastro-intestinal tract and other viscera.

The illustrations show not only the density of the shadow but also its clear delineation, when this solution is injected either into the bladder, ureter or pelvis of the kidney.

Further clinical studies are being pursued, and a report of their results will be published later; but the advantages of this neutral solution of thorium nitrate and sodium citrate for pyelography and other skia-graphic studies are so great that this preliminary report is now given. It is being used regularly in all our suitable urologic cases, and apparently is perfectly innocuous. If further experience confirms our present studies, it seems probable that we have in it a method of great value to urologists and roentgenologists.

SHORT CIRCUIT OF THE VAS DEFERENS

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By short circuit of the vas I mean joining together the patent lumen of the vas with a section of the epididymis or testicle. Just a word regarding the anatomy of these parts in order to make the following clear.

The testis is composed of an enormous number of much convoluted seminiferous tubules, which fill up the intervals between the septums. These tubules form larger tubules, and finally make up the vasa efferentia, and on reaching the head of the epididymis form a larger tube which is called the canal of the epididymis. After a tortuous course, this ends at the globus minor and opens into the vas deferens. This is at the extreme lower pole of the testicle. The vas deferens begins at the tail of the epi-

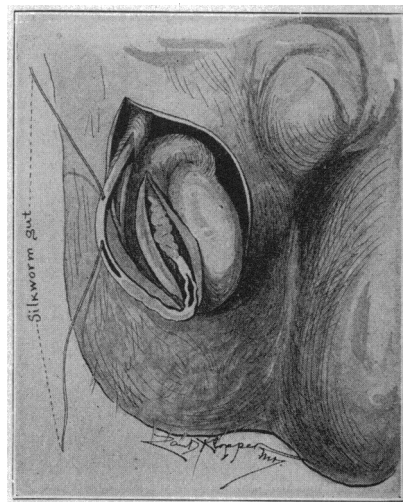


Fig. 1.—Exposure of vas deferens; silk worm gut in lumen of cord.

didymis and ends in the common ejaculatory duct, where it enters the prostatic or first part of the urethra.

The operation under discussion is usually done to repair an old gonorrheal epididymis in which there is an obstruction of the vas between the tail of the epididymis and the external inguinal ring. It is of the greatest importance, therefore, to know whether that part of the vas is patent between the external inguinal