A very circumscribed induration and redness of the skin, very closely resembling erysipelas, will usually surround the site of injection for a few days. This occurs in tuberculous and non-tuberculous cases alike. Abscess formation can always be avoided except in syphilitic subjects, where it is very prone to occur.

The so-called "local reaction" at the site of the tuberculous lesion may be very slight; in fact, even where the general reaction is distinct the local reaction often cannot be detected either in affected lungs or joints. In lupus the local reaction is usually distinct.

That tuberculin might sometimes be used to advantage in recognizing advanced, as well as early cases, of pulmonary tuberculosis, is shown by the fact that of the 2240 cases sent to the Cook County Hospital for Consumptives 239, or over 10 per cent., were not tuberculous; 263 showed no tubercle bacilli in the sputum. Of these 24 were proven by the aid of tuberculin to be cases of tuberculosis.

Also in excluding the 239 non-tuberculous cases tuberculin was often of service; for with the microscope and the stethoscope alone it is manifestly much easier to confirm than to disprove a diagnosis of phthisis.

**CONCLUSIONS.**

Tuberculin in doses of .005 carefully increased, when necessary, to .010, produced no bad effects in simple or complicated tuberculous or non-tuberculous cases.

The characteristic tuberculin reaction is shown by a rise of at least 2 degrees in temperature, reaching its height in from 6 to 36 hours after the injection, typically at the 18th hour; and accompanied by at least two of the following symptoms: chilliness, headache, nausea and muscular pains.

The tuberculin test ranks in value with the Widal typhoid test since in the former the technic is simpler; the materials are more readily obtainable and more permanent; the danger is no greater and the information obtained is scarcely less reliable.

**THE PARAFFIN INJECTION TREATMENT OF GERSUNY, WITH A REPORT OF CASES.**

**RUPERT M. PARKER, M.D.**

**CHICAGO.**

About two years ago a young man, who had undergone a double castration, presented himself to Gersuny with the complaint that, being obliged to go before the military medical board of Austria for examination, it would be humiliating to display his defect.

Gersuny, having incidentally observed, in connection with certain therapeutic measures, that paraffin of a low melting point, when injected into the tissues of the body, remained indefinitely without reaction, conceived the idea of substituting paraffin prosthesis for the absent members. He injected various quantities of paraffin at different times, and accomplished the desired result, which he reported shortly afterwards, together with the details of his technique.

The success of his first trial encouraged Gersuny to make other applications of his treatment. The second patient, a woman, suffered from absolute incontinence of the urine, which had resisted repeated operations for its relief. The urethra was widely dilated and its mucous membrane was prolapsed. Paraffin was injected under the prolapsed mucous membrane and the latter pushed into the bladder so that the deposits of the wax came to rest within the internal meatus. Then a ring of paraffin was injected beneath the skin around the external meatus, to prevent a recurrence of the prolapse. After injections of various quantities of paraffin at different times, Gersuny finally succeeded in producing complete continence, and at the last report from the patient, one year after the final treatment, urine could be retained from eight to ten hours at a time.

Since the publication of these two cases, other surgeons, as well as Gersuny, have employed the treatment in various pathological conditions. In a case of urinary incontinence in a female, Kapsammer injected the paraffin below the urethra, which was thus crowded upward and arched over the prosthesis, a condition resembling that of the hypertrophied prostate in the male. Pfennsies reported an unsuccessful attempt in treating a case of bladder insufficiency almost identical with that of Gersuny. He used the same method but deviated somewhat from the original technique and observed the typical symptoms of a lung embolus as a complication, which will be considered later. Halban and Moszkowicz have reported cases of cystocele, prolapse of the vagina and prolapsus uteri with retroversion successfully treated by the injection of paraffin into the vaginal walls and the parametrium. It is self-evident that such an application is permissible only when future pregnancy can with all probability be excluded and when the radical operation must be avoided.

Gratifying results were obtained from the injections for the relief of incontinence of the feces following an amputation of the rectum for carcinoma and after operations for peri-rectal abscess and fistula in ano. Complete continence was secured in the two latter cases, and continence, except for fluid stools, in the former. Three months after the final treatments the good results were still present. Hard feces were passed with difficulty, making it necessary to use enemata and avoid constipation. Paraffin injections have been used to some extent in the treatment of inguinal hernia. Moszkowicz reported two cases of large scrotal hernia which had repeatedly become incarcerated in spite of attempts at mechanical support. The inguinal canal was narrowed from a diameter admitting four fingers to that admitting one, by injections of paraffin into the surrounding tissue. The contents of the sac could then be satisfactorily retained by means of a truss. Seven months after the treatment of one case and ten months in the other the improved conditions were unaltered. Experience has taught in these cases, however, that the paraffin in the loose tissue about the inguinal canal is liable to become displaced and sink into the scrotum unless sufficient time is allowed for its encapsulation before the truss is applied. Gersuny does not consider his method a substitute for the radical operation in the treatment of hernia, but an alternative when the latter is contra-indicated.

Among numerous other applications the injection of paraffin about the ends of a resected nerve has been found useful in preventing their reunion. The introduction of paraffin between the surfaces of a joint after the breaking of an old ankylosis has been suggested to prevent a recurrence of the adhesion. A substance like paraffin which can be easily removed after the joint surfaces have healed is much more suitable than the firmer materials, such as celluloid, silver, tin and rubber, employed by Ckmusky. However, the practical application of paraffin to this purpose has not been sufficient to establish its utility.

Gersuny has found a limited use of his treatment in oral surgery. A small opening between the nose and the
mouth, left after a staphylorrhapy; was closed by injections of paraffin. In another case following staphylorrhaphy, the venum was too short to be approximated to the posterior pharyngeal wall, so that hard "g" could not be pronounced. Injections under the mucous membrane of the posterior pharyngeal wall and of the uvula caused the former to bulge forward and the latter to elongate sufficiently to overcome the defect.

Most satisfactory and startling results of the treatment are seen in the correction of unsightly deformities following cicatricial contractions resulting from wounds and loss of tissue through disease and operative measures. The resection of the superior maxilla in one patient and of several ribs in another was responsible for two disfigurements corrected by Gersuny. In the latter case the depression was so great that an injection of over two ounces of paraffin was required to fill out the chest to symmetrical proportions. This is the largest amount of paraffin ever injected into the human body. As most suitable for the purpose of filling out smallpox pits and other cicatricial retractions, Gersuny recommends a mixture of four parts of olive oil to one of paraffin. To overcome the defect it is usually necessary to make the depressed area bulge. The oil is absorbed and the surface becomes even. Where the scars are firmly bound to the underlying tissue by adhesions, it is necessary to separate them by means of the bistoury. Moszkowicz and Rolmer have reported the injection of paraffin into the retro-orbital tissue, thereby supplying a deficient support for an artificial eye. In the correction of the saddle nose which has resulted from either trauma or osteomyelitis highly satisfactory results are reported by Moszkowicz. Stein and Heath. The writer also has employed the treatment in the correction of two cases of saddle nose, a report of which follows with a description of the technique used.

The paraffin should have a melting-point slightly above the normal temperature of the body, i.e., between 99 and 104. If it is below the body temperature it will soon be carried away by the lymphatics and if the paraffin is too hard it may cause necrosis, as in the case treated by Foederel. There is no paraffin on the market with the proper melting-point, so far as I can learn.

The ordinary lump paraffin is much too hard and the paraffin known as white or medicinal vaseline is too soft. These two products may be melted together in proportions to secure the desired consistency, or the liquid vaseline and the lump paraffin may be mixed. The ordinary soft paraffin in lumps and oleum petrolatum were used in the treatment of my cases. The melting-point of the mixture was tested with the clinical thermometer. The bulb was smeared with a thin coating of the wax and immersed in a water bath, which was gradually heated until the melting-point was reached, when the wax loosened itself and floated to the surface as a globule of oil, and the thermometer indicated the temperature. My finished product had a melting-point of about 102°F, and its consistency was that of vaseline. It was sterilized, as Gersuny recommended, by heating it at its boiling-point for a few moments. This process is reasonably certain to kill all pathogenic germs, as the boiling-point of the paraffin is much above that of water.

For the purpose of injection an ordinary hypodermic syringe with a large needle might have been used, but as the paraffin hardens and destroys the leather valves and loosens the cement in the joints around the glass barrels, a syringe constructed entirely of steel was found more serviceable. The syringe was aspirated full of the melted paraffin, inverted, and the piston pressed upward sufficiently to expel any bubble of air present in the cylinder. The needle was then screwed firmly on its attachment and, to prevent its contents from hardening too rapidly, the instrument was placed in hot water until needed. Just before inserting the needle for injection, the syringe and its contents were tested by strong, steady pressure on the piston. If the needle had become clogged, the obstruction was removed by a strand of fine wire. The paraffin was allowed to cool sufficiently to flow from the needle, not as a liquid, but as a warm-like, semi-solid, coherent string. The patient, as a rule, required no preparation beyond the usual antiseptic precautions. When the tissue to be injected was very dense and inelastic, the injection of paraffin was preceded by one of Schleich's solution, which served to anesthetize the region and at the same time dilate the lymph spaces in anticipation of the paraffin. The needle was always

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introduced at some distance from the seat selected for the prosthesis and then carried under the skin to the desired point. If the needle were inserted through the skin directly over the prosthesis, more or less paraffin would escape through the tract of the needle after its withdrawal. The paraffin was distributed as desired by changing the position of the needle-point while an assistant molded the prosthesis with the fingers as it was deposited in the tissue. The skill required in the injection and distribution of the paraffin was previously acquired by a few experiments on animals.

Case 1.—This was a patient of Dr. E. B. Fowler, to whose courtesy I am indebted for the opportunity of presenting this case. Wm. T., aged 23, received a traumatic injury of the bridge of the nose eleven years ago. The deformity which resulted is shown in photograph no. 1, taken immediately before the first injection. On Dec. 6, 1901, 2.5 c.c. of paraffin were injected by Dr. Fowler and the writer. The point of the needle was inserted under the skin on the dorsum of the nose, slightly below the level of the eyebrows, and pushed as far downward as it was desired to begin the prosthesis. The result of the first injection is shown in photograph No. 2, taken immediately afterwards.

The pain experienced was inconsiderable; no anesthetic was required in this or subsequent treatments. The reaction was at its height two days later and consisted in a feeling of tension in the skin of the nose, slight frontal headache, some erythema and a moderate amount of edema of the nose, spreading somewhat upon the face. December 15 the reaction had so far subsided that a second injection was permitted. With the needle inserted at the tip of the nose, .5 c.c. was injected. The reaction was less than by the first treatment.

The patient presented himself again on Jan. 5, 1902. Although the curve of the bridge was uniform, he was not yet satisfied, as the nose was very broad at the base, and out of proportion to its height. Another injection of .5 c.c. was given. The prosthesis has gradually increased in hardness until now it has the consistency of a cartilage.

Case 2.—Mrs. G. presented a deformity of the nose, shown in photograph No. 4, as the result of an ulceration nine years ago, which destroyed the whole cartilaginous septum and the cartilages of the alae. An injection of 1 c.c. of paraffin on December 8 corrected the sagging completely, but the collapsed condition of the alae remained unimproved after repeated injections, owing to their lack of support. The reaction following the injections in this case was very slight. Infiltration of Schleich’s solution preceded the paraffin injections into the alae, on account of their dense, inelastic tissue. The results of the treatment in both cases were most gratifying to the patients and their friends.

Several objections have been raised to the injection treatment of Gersuny. Meyer holds that the paraffin is more or less toxic and his contention is corroborated by an extent by the experimental work of Straume, Dunbar, Stubenraht and Sobieranski. On the other hand, Stein injected liquid vaseline under the integument on the backs of white mice, in quantities equal to one-third their body weights. No rise of temperature or other constitutional disturbance followed. Only one mouse died and that from mechanical injuries. Whether the constitutional disturbances observed by the other investigators, above mentioned, resulted from mechanical injuries in the administration of large quantities of the coal-tar oils, or whether the injury was of a toxic nature, matters little so far as the Gersuny treatment is concerned. The amount of paraffin is relatively so small and its absorption, if it occurs at all, is so slow that toxemia from the paraffin injected for surgical purposes is not to be feared.

Meyers also objects that the paraffin used by Gersuny will be eliminated from the body by absorption. To prove this he carried out a series of experiments on animals, but admits that his results were not conclusive. Jackuff found that non-watery fluids like liquid vaseline, when injected into the bodies of animals, are not directly taken up by the lymph vessels, but undergo a fine subdivision by the ingrowth of connective tissue and are finally converted into emulsions, the small globules of which are held in the meshes of the connective tissue and finally carried away by the lymphatics. In the margins of an old paraffin prosthesis the same histological process was seen by Gersuny. No case has been observed long enough to decide whether the paraffin finally undergoes absorption or not. In Gersuny’s oldest case no diminution in the size of the prosthesis could be detected after two years. From this we know that if elimination of the paraffin does occur it is a very slow process. The objection from Werthmuth, that
paraffin injected into the pelvic tissue may become displaced by coitus and obstruct the ureters by pressure, is more theoretical than practical. At least no such accident could occur after the prosthesis has had two or three weeks' time to become fixed by encapsulation.

Another and a more credible objection to the treatment of large subcutaneous tumors is the method of paraffin injection. If paraffin is injected directly into a vein in Pfannenstiel's complication of lung embolus following the injection of 30 c.c. of paraffin, the case ran a mild course with recovery. Friends of the treatment blame Pfannenstiel's technique for the accident, inasmuch as he used paraffin with a melting-point of 113. They claim that in order to inject 30 c.c. of such paraffin at one injection, a much higher temperature would be required to prevent hardening before the process could be completed, and that the degree of heat may have caused coagulation in a vein, hence the embolus. The experience of the dermatologists with the injections of mercury suspended in liquid paraffin and other allied oils is instructive as to the dangers of embolus in the paraffin injections. Hartung saw only one case in 5000 intermuscular injections, and Möller observed 28 in 3835 cases. He then changed from inter-muscular to subcutaneous injections, and found no embolus in 240 injections. Neisser had one among 800, and Epstein one among 3822 subcutaneous injections. The majority of the cases of emboli following intermuscular and subcutaneous injections of oils are very mild, with transitory symptoms and I know of no fatal case ever reported. When a semisolid paraffin is injected, it is reasonable to expect fewer emboli than have occurred with injections of oil.

From the results of the paraffin injection method of Gersuny already obtained, I think it justifiable to claim for the measure a permanent place in the treatment of appropriate cases. Even though future experience proves a slight danger from lung embolism, the treatment will find application in cases which can not be relieved in any other way, and in those in which other measures are far more dangerous or absolutely contra-indicated. It may be that the paraffin is slowly absorbed, but many patients will gladly submit, at long intervals, to so mild a measure for the relief of defects which are social stigmata, when they would shrink from the dangers of a more severe operation.

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A NEW COUPLER FOR RAPID INTESTINAL ANASTOMOSIS.*

EVAN O'NEILL KANE, M.D.
KANE, PA.

The variety of mechanical devices and stitches recommended for intestinal anastomosis is so great as to sufficiently prove all to be inadequate. The loss of one of my patients in whom I placed a Murphy button, on account of a plug skin occluding its small aperture like a valve, brought forcibly to my notice the danger in its employment. The loss of two others, however, in which I subjected them to the shock incident to prolonged exposure of the intestines during suturage with mauling and bruising and needle puncturing common in such cases, made me still unwilling to lay aside Murphy's contrivance.

I began a series of experiments seeking to elaborate some device which would possess the advantages of the Murphy or the Frank button but with an aperture of ample dimensions and admitting of a larger and wider intestinal overlap. I determined, also, to do away with stitches of any kind and to make leakage impossible. After much work and experimentation I believe I have succeeded in producing a coupler that answers every purpose, at least until something better can be devised.

I have as yet employed this latest modification of my coupler upon but one human subject, a boy who unfortunately died three days after operation from a general septic peritonitis (result of a neglected typhilitic abscess and requiring a resection of gut for gangrene), too soon therefore to allow of the complete detachment of the coupler. In this case, however, a firm union by lymph exudate had taken place around the entire circumference while a rarifying necrosis had already commenced in the portion compressed between the flanges. Among the living animals upon which I experimented were two dogs and three cats, all of which made perfect recoveries. They passed their couplers at periods varying from three to five days after the insertion, with the exception of one cat, which disposed of its coupler when out on a ramble, the precise date not being known.

The principles essential to assure success are as follows: 1. Rapidity of execution. 2. A patulous canal with a caliber sufficient to make occlusion impossible. 3. No possibility of overtightening. 4. Ambient surfaces free of organic surfaces around the entire lumen. 5. A sufficient overlap to insure obtaining sound live gut within and about the field of union with active circulation. 6. The least amount of handling during the necessary manipulation. 7. The least number of needle punctures and suturage. 8. Simplicity of construction and application such as will render its employment intelligible and applicable by any novice. 9. It should not be large enough to make it a source of obstruction after it becomes detached.

My coupler consists of three cylinders, two outer and one inner one. The latter has a length equal to that of both the former, which are large enough to slip easily over it, besides allowing a layer of gut to be interposed. The inner cylinder has a depression around each end and a projecting flange. The distal margins of the outer cylinders are incurved to the same caliber as that of the inner one. The proximal margins are also inverted but only to a sufficient degree to enable them to catch upon the flange of the inner cylinder when they are drawn apart. By means of two perforations opposite each other in the incurved distal surfaces of each of the outer

* Read and demonstrated before the McKean County Medical Society, Dec. 12, 1901.