ALCOHOL INJECTION OF THE GASSERIAN GANGLION FOR TRIGEMINAL NEURALGIA.

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DURING the last 3½ years I have seen 90 cases of intractable trigeminal neuralgia, 86 of whom I have treated with alcohol injection; 65 were females and 25 were males. In only three cases was no relief obtained, owing to the nerve not being found; one of these had previously been operated on unsuccessfully for gasserectomy and the scar tissue was so dense that it was impossible to manipulate the needle. In three others slight definite improvement resulted and in the remaining 80 cases complete relief was obtained for intervals varying from as little as two months and four months in two cases to 2½ years and more. For the majority 12 months' complete relief of pain may be looked on as a minimum; if the nerve is definitely hit and anaesthesia produced; while two to three years and more may be expected when the depth of the anaesthesia indicates that the nerve has been properly destroyed by the alcohol.

Several patients have come to me who had previously been unsuccessfully injected with alcohol elsewhere, and I have heard it stated that the treatment was of no use, and also that no anaesthesia is produced by the alcohol injection. That this may be so in the hands of those who have not practised the method thoroughly on the dead body, or who have not the patience to find the nerve before performing the injection in the living patient, I can readily believe. I wish to state most emphatically that such failures in cases of genuine trigeminal neuralgia are due to errors in technique, owing to which the nerve is neither struck nor injected with the drug. Strong alcohol injected into any nerve trunk destroys the nerve fibres almost instantaneously; it is, indeed, a chemical resection of the nerve, and total loss of function of the nerve will ensue until regeneration occurs. It is to prevent this regeneration of nerve fibres that I have adopted the modified technique described below, in order to destroy the nerve cells in the Gasserian ganglion, and thus to render impossible the downgrowth of new nerve fibrils to replace those destroyed by the alcohol.

The great advantage of extirpation of the Gasserian ganglion over Schlösser's method of alcohol injection of the nerve trunks has been the permanence of the cure in the former treatment, as opposed to the temporary relief of a few months to three or more years obtainable by the injection. The severity of the Krause-Hartley operation for extirpation of the Gasserian ganglion, owing to the necessity for a large trephine opening, and considerable pressure being exerted upon the brain during the process of exposing the ganglion, has deterred a large number of sufferers with trigeminal neuralgia from seeking relief by this means.

I have therefore endeavoured to improve on the method of deep alcohol injection of the nerve trunks by carrying the injection of strong alcohol through the foramen ovale into the Gasserian ganglion itself, in order that, by destroying the nerve cells in the ganglion, regeneration of nerve fibres along the degenerated nerve trunks shall be prevented, and thus to substitute permanent cure of the pain for the temporary relief of a few months to a few years which was hitherto obtainable. In this way it appears to me possible to obtain all the advantages of the Krause-Hartley operation without its attendant deformity and dangers, or even the necessity of a general anaesthetic.

In my first paper¹ three years ago on the alcohol injection treatment, I indicated that in practically every case it is possible to pass the needle through the foramen ovale into the Gasserian ganglion, and I had found by experiment on a large number of bodies in the post-mortem room that it was possible to inject the Gasserian ganglion through this foramen, using an alcoholic solution of methylene blue for the purpose, the ganglion being found afterwards stained deeply blue with the dye. I then felt that partial or complete destruction of the ganglion by injection of alcohol into it through the foramen ovale would be the ideal treatment in

those cases of neuralgia which involve the third division of the nerve either alone or in conjunction with the second division, which form a majority of the total number of cases of trigeminal neuralgia met with. No recurrence of the pain after such a treatment should ever happen, just as in cases when the Gasserian ganglion has been successfully extirpated.

It is a debatable question whether in those cases of neuralgia limited to the first and second divisions it is better to practise recurrent injections for the two nerve trunks and leave the important area of sensation on the tongue and lower jaw supplied by the third division unimpaired, or whether it would be better in every case to attack the ganglion through the foramen ovale, and thus render the whole area of the trigeminal nerve anaesthetic. That is to say, is it better to suffer the return of the neuralgia at intervals with recurring injection treatment and retain sensation on the tongue and lower jaw, or is it wiser to purchase permanent immunity from pain at the price of permanent loss of sensation on the half of the tongue and lower jaw, in addition to the numbness over the area of the trunks affected by the neuralgia?

During the last 15 months I have injected the ganglion through the foramen ovale with 90 per cent. alcohol in seven patients, one man and six women. At first I attempted this only in thin subjects who had not been injected before, because of the greater ease of manipulation of direction of the needle, and in patients in whom the third division was chiefly involved, but I have now also used it for cases in which the second division alone was affected, and I am inclined to think it will be the sounder course to use the method also in those comparatively uncommon cases in which the paroxysmal neuralgia is limited to the first and second divisions of the nerve. True trigeminal neuralgia affecting the first division alone is very rare; I have had only one case in 90 cases of the disease.

Destruction of the nerve trunks outside the skull, in cases of trigeminal neuralgia—whether by the knife or alcohol injection—is probably always followed, sooner or later, by recurrence of the pain, the intervals of freedom varying from a few months to three or four years, according to the degree to which the nerve has been destroyed. It is true that in many instances injection of alcohol in the neighbourhood of the nerve trunk has been followed by complete relief of the pain for a few weeks or months, even when no trace of anaesthesia has been produced; such perineuritic injections are, however, most unreliable in their effects, as the pain may recur at any moment. To ensure complete freedom from pain for many months it is necessary to inject the alcohol into the nerve trunk, so that lasting anaesthesia shall be produced. The success of the injection can be accurately gauged by the depth of the anaesthesia produced, and if this be done properly, so that there is complete loss of sensation to touch, pin-prick, and to pressure over the larger portion of the area supplied by the nerve, we may then count with tolerable certainty on complete relief of the pain lasting from twelve months to two or three years. I have, indeed, several patients who have had no return of pain whatever for the last two and a half years. Extremely satisfactory though these results are, as the injection can be repeated if the pain returns, yet it is obviously preferable to obtain permanent relief, without having recourse to renewed injections at intervals.

I first injected the Gasserian ganglion with alcohol 13 months ago for a man with typical tic douloureux of the second and third divisions. He still remains perfectly well, with no pain of any kind, and though an equal result so far might have been obtained by injection of the superior and inferior maxillary nerves outside the skull, yet the probability is strong that the immunity from pain in his case will last far longer, if not permanently.

CASE 1.—The patient, aged 43, sent to me at St. Mary's Hospital in November, 1910, by Mr. C. A. Morton, of Bristol, began to suffer from typical tic douloureux in the right cheek and nose two years previously. After suffering for 18 months spasms of gradually increasing severity, the infra-orbital nerve was divided on the cheek by Dr. A. Fells. This gave him relief of all pain for three months, with resultant numbness of the cheek, right upper lip, and side of nose. In July, 1910, similar spasms of pain started in the right lower jaw, the pain darting back into the ear and into the back of the tongue. These spasms of acute pain continued daily in increasing number until his admission to St. Mary's on Nov. 24th. There was then no detectable anaesthesia on the right cheek or upper lip, or elsewhere.

On Nov. 26th I injected the right foramen ovale, using a few drops of 2 per cent. eucaïne, followed after a few seconds by 20 minims of 90 per cent. alcohol. The patient said afterwards the injection caused practically no pain at all. There was produced immediately complete anaesthesia of the whole of the right fifth nerve distribution to all forms

¹ Proceedings of the Royal Society of Medicine, Neurological Section, Feb. 25th, 1909, p. 80. See also THE LANCET, May 8th, 1909, p. 1310.

of sensation, touch, pressure, and pin-prick, with loss of the right conjunctival reflex, and also complete loss of taste on the right half of the tongue; the palate unfortunately was not tested. Next day the anaesthesia had diminished considerably on the forehead and cheek, so that a firm touch or pressure was now felt, though there remained complete analgesia to pin-prick (Fig. 1). A week later light touches

FIG. 1.

CASE 1.—Chart of sensation: loss on right fifth nerve area, taken Dec. 31st, 1911, thirteen months after the injection of the ganglion. The dotted area indicates loss of perception of light touches and complete loss of perception of pin-prick, except as a touch or pressure.

were still unperceived on the forehead and cheek, and only firm pressure of the lower lip and chin, though the analgesia remained complete as before.

Now, 13 months later (Dec. 31st), the patient has had no return of pain whatever, and on examination I find he still cannot feel a pin-prick at all on the right fifth nerve area, and also there is very definite loss to light touch, with loss of the conjunctival reflex. The analgesia extends over both upper and lower jaws inside the mouth and includes the right half of the tongue, and the hard palate as far back as its junction with the soft palate. Although at first after the injection there was weakness of the right masseter and pterygoids, this has now completely recovered.

The recovery of the motor paresis of the jaw muscles, in spite of permanent analgesia, is explained by the fact that the motor trophic centre lies in the motor nucleus in the pons, the motor branch of the fifth having no connexion with the Gasserian ganglion. Consequently, an injury to the motor fibres by alcohol injection, even inside the foramen ovale, may be recovered from, whereas the trophic centres for the sensory fibres of all three divisions of the trigeminal are the nerve cells within the ganglion. Destruction of the motor portion of the nerve, and consequent permanent disfigurement from wasting above and below the zygoma, is a constant result of the major operation for excision of the ganglion, owing to a considerable portion of the motor branch being necessarily destroyed with it.

My technique for injecting the Gasserian ganglion varies only in detail from that of injecting the inferior maxillary nerve at the foramen ovale; instead of inserting the needle close below the lower border of the zygoma, I choose a point either on or slightly below the line joining the incisura notch to the ala nasi. This line in the average skull, when the teeth are in position, corresponds to the lower border of the sigmoid notch of the lower jaw. To reach the foramen ovale, therefore, the needle must be directed slightly more upwards, making it thus easier to pass the point through the foramen. As soon as the nerve is reached at the foramen, I inject it with 90 per cent. alcohol, using about $1\frac{1}{2}$ c.c., but if no general anaesthetic is being given I precede the injection of the alcohol by injecting 6 or 7 minims of 2 per cent. eucaine solution into the nerve, thus rendering the subsequent injection of the alcohol comparatively painless. If there is as a result deep anaesthesia of the lower lip and chin, which will certainly develop at once if the nerve itself has been injected, I then feel with the point of the needle for the lips of the foramen ovale, if this has not already been felt. Sometimes the needle slips easily through the foramen, sometimes it has to be worked through, but no degree of force should be used.

In two instances I have found that after feeling the lips of the foramen with the point of the needle injection of the nerve at that point has produced total anaesthesia of the whole fifth nerve, no doubt owing to the alcohol infiltrating the tissue of the ganglion by passing through the root of the third division, as I have seen many times occur in the dead body when injecting the nerve at the foramen ovale. During

the injection the patients complained of pain spreading into the cheek and forehead, and in both of them I considered it unnecessary to work the needle through the foramen into the ganglion, but in both the depth of the anaesthesia on the first and second divisions faded away after 10 or 15 minutes, so that tactile sensations began to be perceived on the forehead and cheek, and on the following day tactile sensation on these areas was practically normal again, though pin-prick was perceived only as a touch.

If the tic douloureux is affecting the third division alone, and this is the commonest variety in my experience, the inferior dental being by far the most frequently involved, such a result is, I think, the ideal to be aimed for, but if the second division is also affected by the pain, as in the upper gum, cheek, or nose, then more of the ganglion must be destroyed, and the needle must be worked through the foramen into the substance of the ganglion to the depth of another quarter of an inch. A drop or two of the alcohol is then cautiously injected, considerable resistance to the push of the piston being experienced if the point of the needle remains within the nerve tissue. Another $1\frac{1}{2}$ c.c. of alcohol should then be injected, a few drops only at a time, at intervals of not less than two minutes, meanwhile testing the sensation on the cheek and forehead with a blunt pin. When neither the pressure of the head of the pin or a sharp prick on the forehead is any longer perceived at all, enough has probably been done, and the needle should be slowly withdrawn. Even now the depth of anaesthesia will probably fade away after half an hour or so, so that on the following day deep anaesthesia and loss of taste may persist on the palate, and complete loss to pin-prick and even to pressure on the upper lip and lowest part of the cheek, yet tactile sensation may be fair on the forehead and below the eye, with a normal conjunctival reflex. When this is the case there is no danger of any keratitis supervening, such as may occur when total anaesthesia of the eyeball persists after complete destruction of the ganglion.

Sometimes, after pushing the needle through the foramen ovale, the point of the needle may leave the nerve tissue and enter the cave of Meckel, and cerebro-spinal fluid may drip from the needle. If the injection of alcohol be then commenced no resistance will be felt to the push of the piston, and instantly the patient will complain of severe headache at the base of the skull and back of the head. Should this occur the needle must be partially withdrawn, and then worked through the posterior edge of the foramen, so as to keep the point within the substance of the ganglion.

Another result of this slight error in direction that may occur is that the point of the needle may pass in front of the ganglion and strike the root of the second division of the nerve before it enters the foramen rotundum. This is recognised by the patient's sudden complaint of pain in the nose and cheek, and if the nerve be injected here, deep anaesthesia on the hard palate and sometimes on the front of the soft palate, together with total loss of taste on this area will be produced, in addition to the anaesthesia of the upper jaw, nose, cheek, and upper lip which would result from injection of the nerve by the ordinary route in the sphenomaxillary fossa. This has happened to me in two cases, in both of whom deep anaesthesia and complete loss of taste on half the palate were produced, together with complete analgesia on the upper lip and lower part of the nose, the analgesia becoming slighter below the eye, not sufficient alcohol having been injected to destroy the whole nerve completely.

More often than not injection of the second division in front of the foramen rotundum by the ordinary route produces little or no anaesthesia on the palate, though there may be deep anaesthesia as a result on the jaw, nose, and cheek; this is no doubt due to the nerve trunk being struck in front of the branch to Meckel's ganglion. Another branch which I have never found anaesthetic after injection at this point is the temporo-malar, the anaesthesia always ending sharply at the outer canthus of the eye. Whether this is due to the usual area assigned to the temporo-malar branch receiving alternative supply from the auriculo-temporal or supraorbital nerves, or whether it is due to the temporo-malar branch originating far back from its main trunk, almost at its exit from the foramen rotundum, I am uncertain.

Injection for the second division at the foramen rotundum is usually more difficult than for the third division at the foramen ovale, and in a certain proportion of cases it is

impossible. There is also more likelihood of hæmatoma from wounding the internal maxillary vessels.

These points are additional reasons for my preference for injection of the Gasserian ganglion through the foramen ovale.

CASE 2.—In one patient, a lady 86 years of age, who had suffered from tic douloureux of the second division chiefly, and to a less degree of the third division on the right side for the past eight years, I injected the right Gasserian ganglion two months ago under chloroform. Using the method I have described, I was able to feel the lips of the foramen ovale with the point of the needle, although the patient was unable, of course, to give me the indication of feeling an electric twinge down into the lower lip and chin. I injected only 1½ c.c. of 90 per cent. alcohol without any eucaine, but after the patient came round from the anæsthetic complete anæsthesia on all three divisions was present, with loss of taste as well as loss to pin-prick on the right half of the tongue. There has been no recurrence of pain whatever since, though she complained of a "wooden" feeling of the whole of the right side of the face.

CASE 3.—In another patient, a lady aged 41, I injected the left Gasserian ganglion twice in October last, with ten days' interval, using 2 c.c. of 90 per cent. alcohol on each occasion. She had suffered from severe tic douloureux of the left second and third divisions for five years. Two years before she came to me she had obtained relief from a course of numerous injections of alcohol, for which she was put under general anæsthesia six different times. As a result of that treatment she had diplopia which lasted nearly three months, and paralysis of the pupil, though the pain was completely relieved for 19 months, when in July last it returned furiously.

When I saw the patient there was no trace of anæsthesia remaining, though she says she was quite anæsthetic on both lips and jaws on the left side after the treatment. The left pupil was typically Argyll-Robertson in character, there being no trace of reaction to light, but a slow full reaction to accommodation. This is doubtless due to the alcohol two years ago having infiltrated the nerve branch to the inferior oblique, during the process of injection of the second division in the sphenomaxillary fossa.

On Oct. 16th last I injected the third division in this patient, local anæsthesia only of ethyl chloride spray and eucaine being used. Using the method I have already described above, I injected the nerve at the foramen ovale, and also the Gasserian ganglion, using altogether 2 c.c. of 90 per cent. alcohol. The immediate result was complete anæsthesia on the lower lip and tongue and the rest of the third division, with complete loss of taste on the front of the tongue on that side, with deep analgesia and loss of light touch over the remainder of the fifth nerve supplied by the second and first divisions. Although the conjunctival reflex was partially lost no keratitis followed, but pain of a darting character still troubled her in the lower jaw and cheek and also in the temple, where she had not had it before.

Ten days later I therefore injected again into the Gasserian ganglion through the left foramen ovale, passing the needle to a depth of just 2 inches. I used no eucaine this time, but injected 2 c.c. of 90 per cent. alcohol slowly into the ganglion. When finishing the injection she became somewhat faint and retched a little, and she was kept in bed for the next two days, slight giddiness and retching continuing for that time. Total anæsthesia to all forms of sensation, touch, pin-prick, and pressure was immediately produced over the whole area of the fifth nerve,

including the eyeball, auditory meatus, and to a less extent the membrana tympani. There was complete loss of taste on the front of the tongue on that side, as before, and now also loss of taste on the left half of the front of the palate (Fig. 2).

During the next fortnight she complained of darting neuralgic pains in the left cheek and temple, which gradually diminished and then disappeared entirely, the anæsthesia remaining as intense as before. Keratitis developed in the anæsthetic eye on the fifteenth day after the second injection, necessitating sewing together of the lids for a time, but she is completely cured of her neuralgia, and I think is likely to remain so permanently.

On another occasion I should not attempt such rapid or complete destruction of the ganglion owing to the faintness produced and the risk of keratitis, but if the injection is made slowly, only a few drops being pushed in at a time at intervals of two minutes, the depth of the anæsthesia can be graduated almost to a nicety and no unpleasant symptoms whatever will result.

If a general anæsthetic is used, and some patients insist upon it, chloroform is usually the most suitable, and it should be given lightly, and as soon as the needle reaches the nerve there will probably then be strong reflex contraction of the facial muscles on that side, as though pain were felt, though afterwards there is no recollection of feeling anything. In my first paper in 1909 I described this sign as a definite indication that the nerve is reached, but experience has since taught me that it is not an infallible sign, and equal reflex screwing up of the face may occur when the nerve has not been reached.

If, under an anæsthetic, the lips of the foramen are felt by the point of the needle, or from other indications it is assumed that the point of the needle is within the nerve, the anæsthetic should be discontinued, and the injection of the alcohol begun slowly, a few drops at a time. As consciousness commences to return it will be found that a smart prick upon the chin or lower lip evokes no reflex movement at all, if the alcohol has been placed correctly within the nerve, owing to the anæsthesia of

the skin immediately induced, while a pin-prick upon the other side of the chin or lip will provoke strong reflex movement and signs of displeasure, long before the patient is sufficiently conscious to answer questions. Should, therefore, the reflex contractions of the face be equally brisk on the two sides, a little more anæsthetic may be administered, and a fresh attempt then made to find the foramen and then to inject the nerve.

I have thus in several patients been able to inject the third

FIG. 2.

CASE 3.—Chart showing area of anæsthesia after the second injection of the left Gasserian ganglion on Oct. 26th. The shaded area indicates loss to touch, pin-prick, and to firm pressure. The kidney-shaped area above the left eye indicates an area of skin which showed no anæsthesia at all after the first injection on Oct. 16th, but became completely anæsthetic after the second injection. The dotted area indicates loss to pin-prick, with only slight tactile diminution, her comb not being felt properly, and pin-prick perceived only as touch.

FIG. 3.

Injection outfit consisting of steriliser 6 in. by 3 in., fitted with cover, reversible to form tray; perforated tray fitting into steriliser or cover, containing flat metal plate with clips to hold eight needles in cases, and two syringes. The syringes and needles required are taken out and placed in the tray for boiling in weak soda solution. In front is seen a 2½ in. needle, 1.25 mm. calibre, with stilet.

division at the foramen ovale under chloroform successfully in whom I had previously been unable to find the nerve owing either to their inability to keep still or else to the fact that patients do not always complain of a twinge of pain along the whole distribution of the nerve's supply, and thus the needle may have been correctly placed and then partially withdrawn and tried in a different direction, owing to the failure of the patient to give the expected signal when the nerve was hit. That this undoubtedly does occur sometimes I have had definite proof in three patients when injecting the infra-orbital nerve at the infra-orbital foramen. All three denied feeling any pain in the upper lip or nose when the needle was inserted into the infra-orbital foramen, and the injection was completed, in each case producing deep anaesthesia of the whole distribution of the nerve without any pain being felt at all in the upper lip, although this part became as deeply anaesthetic as the rest.

To get good results it is necessary to have suitable tools to work with, and it may be of value to others who wish to try this treatment to know what type of needles and syringe I use. Messrs. Maw and Sons have supplied to my designs an outfit (Fig. 3) consisting of a 6 in. by 3 in. steriliser with perforated tray, and a cover with handles, into which the tray also fits. Into the tray slips a flat metal plate on which are arranged in spring clips four split-tube needle-holders, each containing two needles, and two Record syringes with their pistons separately. The syringes are of 2 c.c. and 20 minims capacity, to be used for 90 per cent. alcohol and 2 per cent. eucaine solution respectively. The needles are of drawn steel, nickelled, with a short sharp point bevelled at an angle of 20°, and long mounts roughened by coarse milling to give a good grip to the fingers, and brass-wire stiletts to fit the bore. Besides two strong hypodermic needles there are one 35 mm. long and 0.6 mm. bore, and another 50 mm. long and 0.9 mm. bore, both useful for injecting the infra-orbital foramen in thin- or fat-cheeked people; two 2½ in. long and 1.25 mm. and 1.1 mm. bore respectively, and two longer and stouter needles, 3 in. and 3½ in. in length and 1.25 mm. and 1.4 mm. bore. The 2½ in. needles I use for injecting the foramen ovale, and in thin subjects also for the foramen rotundum, while the longer needles may be used for the foramen rotundum in larger and stouter subjects. All these needles, except the three smallest, may also be used for lumbar puncture in children and adults, for which they are extremely suitable.

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THE SURGICAL TREATMENT OF STERILITY IN WOMEN.¹

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IN appraising the value of treatment for such a complex condition as female sterility there must ever be present to the mind the necessity for distinguishing between a coincidence and a consequence. This is the more necessary when we consider how little real knowledge we possess regarding the subtle changes which promote or hinder the occurrence of conception in the human female. Anatomical or pathological alterations in structure forming definite barriers to conception are easy to understand, but the more minute changes which underlie the occurrence of conception in many instances still remain a sealed book. It is, however, to the treatment of some of these anatomical and pathological changes in the female genitalia that I desire to direct attention in order to show what surgery can do to promote a cure.

It must be laid down as a fundamental law that no female should be subjected to prolonged and painful treatment or to any surgical operation for the cure of sterility unless it is proved that the male is potent as regards coition and fertility. By way of illustration let me recall two recent examples.

A woman, aged 38 years, came to consult me because she had missed a menstrual period and because her abdomen was enlarging. She had been married 15 years and fancied she was pregnant. I found on examination that she was a *virgo intacta*, and on putting a few judicious questions I ascertained that connexion had never really taken place. Further investigation proved that her husband was impotent.

The second example was that of a woman, aged 36 years, who had been married for ten years and was anxious to have a child, if only for succession reasons. Her husband was ten years her senior and she had had treatment of various kinds and had, of course, been curetted. After a careful pelvic examination of her internal organs no cause could be detected to explain her sterility. I sent her husband to a surgical colleague in order to have his spermatic fluid examined, and it was then found that he had azoöpermia.

These two cases will serve to emphasise the importance of male sterility, a condition which is far from uncommon and which probably accounts for about one-fourth of the cases. So much attention has been directed in the past to the treatment of uterine flexions, fancied or real strictures of the cervical canal and its orifice, and to scraping the uterine cavity, that the ovaries and tubes seem to have been entirely forgotten. Such methods of treatment have proved disappointing to the patients and have brought discredit to the practitioner and his calling. Yet the condition of the tubes and ovaries is one of the most important factors in the reproductive process. How often do we see treatment directed to scraping or attempting to cause enlargement of an undersized uterus, forgetting all the while that the ovaries and tubes may be, and probably are, atrophic, and no treatment directed to the uterus is likely to be beneficial. Quite recently I saw a woman with an undersized flexed uterus who came for treatment because of her sterility and who had been curetted two years previously.

One of the most common causes of sterility in both sexes is gonorrhoea, and in the female it is the results produced in the tubes and ovaries through gonorrhoeal infection which so often lead to permanent sterility. Infection post abortum and post partum may lead to a similar result or infection the result of appendicitis, whilst tubercle may also be a cause. Such infections produce adhesions of the ovaries and tubes to the back and side wall of the pelvis, to the rectum, to the uterus, or to one another, or the Fallopian tubes become thickened and their abdominal ends closed. Improvement under appropriate treatment may result, but with gonococcal infection the results tend to persist, the outstanding features of this infection when attacking the Fallopian tubes and pelvic peritoneum being its chronicity and its tendency to form adhesions.

Cure of Sterility by Double Salpingostomy.

It was not until 1907 that I had an opportunity of proving what could be done for the sterile woman with sealed tubes.

A patient, aged 28 years, was sent to me on account of her sterility. She had been married two years, and since her marriage had had excessive bleeding at her menstrual periods which lasted 14 days. Menstruation previous to marriage had been regular, painless, lasting seven days, and of moderate quantity. She complained of pelvic pain at intervals, slight sickness, and abdominal distension. The uterus was found to be displaced backwards partially fixed through adherent appendages, and the Fallopian tubes were thickened. An investigation into the condition of her husband was made, when it was found that he had had chronic gonorrhoea, which was now cured. I explained what I intended to do to the patient and her husband, and with their consent I operated. The abdomen was opened in the middle line by a sub-umbilical incision, and both Fallopian tubes were found to be adherent, thickened, and completely sealed at their abdominal extremities, each tube terminating in a club-shaped swelling. The ovaries, which were slightly adherent, appeared to be of normal size and structure. One Fallopian tube was brought out through the incision and surrounded with a gauze sponge. An incision was then made along the dorsal aspect of the tube towards the club-shaped extremity for a distance of one inch, thus opening up the abdominal end of the tube. The remains of the fimbriae could be recognised as having been inverted into the lumen. The tubal mucosa was then united to the serous covering of the tube with fine catgut inserted on a curved intestinal needle, thus accurately uniting the edges and stopping all bleeding. The opposite tube was then brought up and treated in a similar manner. The uterus was suspended by intra-peritoneal fixation of the round ligaments, a silkworm gut suture being passed on each side through the fascia of the abdominal wall, muscle, peritoneum, and under the

¹ A paper read before the Harveian Society of London.