REGIONAL ANAESTHESIA: AN ESTIMATE OF ITS PLACE IN PRACTICE.*

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WHAT follows is based on my personal experience, on the observation of several hundred cases, and on the examination of the records of many more cases in which regional anaesthesia was administered in the Mayo Clinic during November and December, 1924, and January, 1925. No attempt is made to treat the subject systematically and as a whole; for such, the treatises of Labat, Braun, Meeker, Gwathmey, and others may be consulted. It is intended here to describe in essential detail those applications of regional anaesthesia which, beyond reasonable doubt, relieve the patient and assist surgical practice.

Preparation of the Patient.

An aperient is administered the night before, followed by a sleeping draught. An enema is given in the morning, and a light meal of tea and toast four hours before going to the operating room. Half an hour before operation, unless a head case, the patient receives from 0.16 to 0.25 grain of morphine, combined in abdominal cases with 0.01 grain of atropine to reduce the liability to nausea. The skin in the area to be injected is treated as for any surgical operation. Preliminary cleansing with benzene and ether is followed by painting with 2 per cent. tincture of iodine. The area is then draped with a single layer of towels, through which the bony landmarks are easily felt. It is an aid to place these towels at definite levels; for example, in a dorsal exposure of the patient, the upper edge of the lower towel should be at the level of the iliac crests, and the lower edge of the upper towel at the level of a selected vertebral spine. If the patient is exposed ventrally, the umbilicus, xyphoid, and pubis are useful levels for the edges of the towels. The lateral towels are best placed at the outer edges of the recti.

Preparation of Anaesthetic and Instruments.

Novocain (Metz) was used throughout the present series of cases. The solution was prepared as follows:

Four hundred c.cm. of sterile 0.9 per cent. sodium chloride were brought to the boiling point in a flask previously boiled for fifteen minutes; 75 grains of novocain were added and the whole gently boiled for three minutes, after which the mixture was diluted with freshly boiled sterile sodium chloride solution to 500 c.cm. This gave a 1 per cent. solution. At the last possible moment before injecting, 0.1 per cent. adrenaline was added in the proportion of 10 minims (not drops) to each 100 c.cm. of the novocain solution.

The glass syringe is graduated for 10 c.cm. and holds an additional 3 c.cm. to admit of aspiration.

It has metal ends, of which the proximal screws on, a metal plunger, and an eccentric nozzle with bayonet catch for the needle. To ensure an accurate fit of plunger and needle, the design of Labat, by Ateliers Gentille of Paris or Sharp and Smith of Chicago, was chosen. The needles are of non-corrosive steel, made as long as compatible with their tensile strength, and of varying size. A useful outfit would include five needles of 50 mm., three of 80 mm., three of 100 mm., three of 120 mm., and several 20 mm. dermal wheal needles. Each of these holds a stilette and is itself held in a metal tube container. There is needed also for caudal anaesthesia an 80 mm. steel spinal needle with a stilette, the end of which accurately fits the end of the needle. At the proximal end of the stilette is a slot and button to show where the bevel of the needle and stilette coincide. The cutting end should be refreshed with a carborundum hone before sterilizing. With the left index finger almost over the point of the needle to press it on the hone, and the proximal end between the right finger and thumb, the point is moved not more than 1 cm. back and forth, the needle making an angle with the hone of not more than 10 degrees. This results in a long narrow bevel which will pierce the skin with a minimum of trauma and

pain. The needles are sterilized by boiling in water for three minutes with stilettes in place. The syringe is kept in an alcoholic solution of phenol and rinsed with sterile water before using.

ANAESTHESIA IN THE PELVIC AREA.

There is no area of the body in which regional anaesthesia is of greater value, or easier of application, than in the pelvis. The anaesthetic is applied to the sacral nerves outside the spinal dura mater. The needle is inserted through the hiatus sacralis for caudal anaesthesia, or through the posterior sacral foramina for transsacral anaesthesia. The anaesthetic may be introduced into both hiatus and foramina in the same patient. This may be called sacral anaesthesia. When the fluid is introduced into the hiatus, anaesthesia may be depended on up to and including the third sacral nerve in all cases. Usually it will include also the first and second sacral nerves. If the fluid is introduced into the third and fourth sacral foramina as well, anaesthesia is prolonged. If introduced into the first and second sacral foramina, then the first and second sacral nerves will certainly be affected. For external haemorrhoids, anal tags, fissures, and fistulas, caudal anaesthesia is adequate. For more extensive pelvic operations, such as prostatectomy or rectal excision, complete sacral anaesthesia is necessary. No further discomfort is caused the patient, since there is already some anaesthetic about the sacral foramina as a result of the fluid introduced through the hiatus. Such sacral anaesthesia admits the freest of pelvic manipulation. There are two limitations: the peritoneum remains sensitive to traction, and approach to the pelvis is confined to the perineal route. The pelvic peritoneum, however, lies in the field of anaesthesia, so that low rectal resection can be performed under sacral anaesthesia, with little or no discomfort, by the perineal route. Since an abdominal field-block permits of the suprapubic approach to the prostate, it follows that sacral anaesthesia, together with an abdominal field-block, will allow of the performance of suprapubic prostatectomy. This anaesthesia, indeed, has been found ideal for prostatectomy. There is complete loss of sensation, with rarely the fall in blood pressure associated with spinal anaesthesia, or the respiratory embarrassment met with in inhalation anaesthesia.

Method.

The patient lies prone on the operating table with a bolster under the hips to elevate the sacrum and buttocks. The draped towels leave uncovered an area from the first lumbar vertebra to the tip of the coccyx, and about as wide as it is long. A small wheal is raised one fingerbreadth above the upper end of the natal furrow. A 50 mm. needle is inserted through the wheal at an angle of about 60 degrees. After it has been passed about 3 or 4 mm. it will be felt to pierce a membrane (the posterior sacro-coccygeal ligament). There is a momentary resistance; then the needle goes quickly for 1 mm. and comes to a stop as it hits the sacral body on the floor of the hiatus sacralis. If it strikes a bone without that preliminary feeling of piercing a membrane and traversing a space, it must be withdrawn until the point is just below the skin and another attempt made. As soon as the point is in the sacral canal, 5 c.cm. of 1 per cent. novocain (in rectal cases 10 c.cm.) are slowly injected. Should subcutaneous oedema occur, the sacro-coccygeal ligament has not yet been pierced, and these steps must be retraced. As soon as the manoeuvre is completed, the original needle is replaced by a steel spinal needle with stilette. If it sticks, it is rotated through 180 degrees. If it is felt grating against bone, it is moved forward or back until the grating sensation disappears. At the end of the manoeuvre, three-fourths of the needle should be in the canal, and there should be no grating sensation on moving it forward or back 1 mm. A grating sensation means that the point is near bone, and is probably in a vein. If, on aspiration, blood or cerebro-spinal fluid enters the syringe, the stilette must be replaced and the needle moved slightly forward or back until subsequent aspiration is negative. The aim is to bring the point of the needle into the centre of the sacral lumen away from the bony walls and outside the dura.

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When the needle is clearly in place, the anaesthetic is slowly injected up to 45 c.cm. if the patient weighs less than 154 lb. (70 kg.), or 55 c.cm. if he weighs 168 lb. (76 kg.). A reaction may take the form of pallor, sweating, nausea, or a rise of the pulse above 120 or a fall below 60, and demands a pause until it subsides. Anaesthesia of the perineum commences in from five to twenty minutes, and the field gradually increases. If it has not begun in half an hour, the suspicion will arise that the needle has not reached the caudal canal. There should be a well marked deepening of respiration, usually apparent after only 1 or 2 c.cm. has been injected. The absence of this deepened respiration will excite strong suspicion that the needle is not in the canal, and it may be well, then and there, to withdraw and reinsert it.

This is for simple caudal anaesthesia. If complete sacral anaesthesia is desired, caudal anaesthesia is first administered, but only 30 or 35 c.cm. are injected. The needle with stylette inserted is then left *in situ*. After a pause of several minutes to allow caudal anaesthesia to extend, transsacral is begun. The posterior superior iliac spine is the starting point. In a fat person there will be a dimple here, in a thin person a bony prominence. At a point 1 cm. internal to this and 0.5 cm. below it a wheal is raised with the small dermal needle. This is over the site of the second sacral foramen. Labat places this foramen 1 cm. below the interspinous line, while Meeker and Scholl find it 2.5 cm. medial to the spine and 1 cm. below. The line from this point to another 1 cm. external to the point of entry of the caudal needle (still left *in situ*) marks the row of foramina. Both Labat and Meeker insist that the sacral cornu offers the most constant relationship to the lower end of this line. The line is divided into three equal parts, and a dermal wheal placed at the juncture of the first and second, and second and third parts, marking the sites of the third and fourth sacral foramina respectively. An 80 mm. needle, or in a thin person a 50 mm. needle, may be inserted at right angles to the skin, through each of the above three wheals, into the corresponding second, third, and fourth posterior sacral foramina. When it enters, if in the exact axis of the foramen, there is a feeling of absence of resistance. If this sensation is not experienced, another attempt must be made. If failure attends the third trial, another foramen should be tried. Each one successfully located assists the determination of the others. The position of the first sacral foramen is determined by producing upward a line connecting the three wheals already made, and taking on it a point as far above the second foramen as this foramen is above the third. The foramina of the other side are next injected in the same way. Into each of the first sacral foramina should be injected 5 c.cm. of the 1 per cent. novocain solution; into each of the second, 4 c.cm.; into each of the third, 3 c.cm.; and into each of the fourth, 2 c.cm. It is best to start injecting the fourth sacral foramen first, then the third and second, since the anaesthesia due to the caudal injection will act at the lower end of the sacrum sooner than at the upper. In this way many patients go through the transsacral injections without pain. If there is pain on raising the transsacral wheals, a little delay will allow the caudal injection to act further. At the close of the transsacral injection, if the patient shows no reaction to the novocain and adrenaline, a further 10 or 20 c.cm. may be injected through the caudal needle, which remains in place throughout the administration. In a few minutes the patient's readiness for operation will be shown by insensibility to a pin prick in the median line of the perineum, and loss of the anal sphincter reflex.

Nomenclature.

The cases classified as "good" were all that could reasonably be desired. Those classified as "poor" were failures, and supplementary anaesthesia was required. In those classified as "fair" anaesthesia was adequate, but in some respect lacked reasonable perfection. Those classified as "intended combined" included mostly cases in which patients were nervous and the desirability of a little comforting anaesthetic at some stage had been anticipated. The class "necessarily combined" comprised not only cases

in which regional anaesthesia failed, but those in which, for a variety of reasons, such as the discomfort of the table, failure of the patient's co-operation, or unexpected enlargement of the field of operation, eventually required a general anaesthetic.

There were 312 cases in which the anaesthetic was given. The results in 261 (83.7 per cent.) were good; in 25 (8 per cent.) poor; in 11 (3.5 per cent.) fair; in 5 (1.6 per cent.) "intended combined"; in 10 (3.2 per cent.) "necessarily combined"; and in 22 (7 per cent.) there were reactions.

SACRAL ANAESTHESIA COMBINED WITH ABDOMINAL FIELD-BLOCK.

Sacral anaesthesia renders the perineum insensitive, but is obviously inadequate if the pelvis is to be reached through the abdominal wall, as is the case in a suprapubic prostatectomy. In this case an abdominal field-block is added as soon as the complete sacral anaesthesia has been induced. The patient is turned over on his back and a dermal wheal raised at the outer border of each rectus, half-way between the umbilicus and the symphysis. Through one of these wheals there is inserted an 80 mm. needle with syringe attached, containing 0.5 per cent. novocain with 10 minims of adrenaline to each 100 c.cm. It is carried, immediately below the skin, to a point just below the umbilicus, and a dermal wheal raised from underneath the skin. It is now withdrawn so that the point lies just under the skin where first introduced, and reinserted in the same direction as before, but at an angle to the skin of 30 degrees. No solution need be injected during the movement of reinsertion. It will be felt to pierce the anterior layer of the rectus sheath, and at this point 3 c.cm. are injected between the layers of the rectus sheath. The terminal branches of the tenth, eleventh, and twelfth dorsal and first lumbar nerves lie in this region. The needle is again drawn back and redirected forward, this time at an angle of 60 degrees to the skin, and another 3 or 4 c.cm. introduced after the needle is felt to pierce the anterior rectus sheath. The manoeuvre is repeated at an angle of 80 degrees, by which time the syringe will be empty. In just the same way a syringe of 1 c.c. is injected from the same wheal toward the superior pubic ramus. A repetition of these injections on the other side blocks off a gable-shaped space through which entry into the bladder is made. Lastly, a 50 mm. needle is introduced just behind and to one side of the symphysis, until it is felt to impinge on the pubic bone. It is slightly withdrawn and redirected downward behind the pubis into the cave of Retzius, where 10 c.cm. are injected on each side. By this time anaesthesia of the gable-shaped space should be complete. If not, reinforcing injections may be given in the same areas.

There were 134 cases in which the anaesthetic was given. The results in 118 (88.1 per cent.) were good; in 5 (3.7 per cent.) poor; in 8 (6 per cent.) fair; in 2 (1.5 per cent.) "intended combined"; in 1 (0.75 per cent.) "necessarily combined"; and in 19 (14.2 per cent.) there were reactions.

REGIONAL ANAESTHESIA OF THE NECK.

Its chief application in this area is in thyroid operations, but it is applied with equal success in block dissection of glands, excision of a thyro-glossal duct, or, as in one case in the present series, cervical sympathectomy for angina pectoris. The object is to bathe the cervical plexus in anaesthetic. The head being turned to one side, a dermal wheal is raised just below the mastoid and another over the cervical transverse processes, at the level of the superior cornu of the thyroid cartilage. Through the first wheal a 50 mm. needle is introduced, and directed medially, slightly downward and slightly backward. The course of the needle can be visualized more clearly if the tip of the left forefinger is placed on the third or fourth cervical transverse process, and held parallel to the direction decided on. When the needle is felt to touch the tip of the second cervical transverse process, it will be found that it slides off the tip readily in any direction. With it in contact with the tip, 10 c.cm. of 1 per cent. novocain and adrenaline are injected. Similarly a 50 mm. needle is introduced at the level of the

superior thyroid cornu over the fourth cervical transverse process, and another 10 c.cm. introduced. It is important to direct the needle downward so that it hits the transverse process in an oblique direction. If it is directed transversely there is a danger of wounding the vertebral artery or spinal dura, as Meeker pointed out. The head is turned to the other side, and two injections of 10 c.cm. given as before. The preceding constitutes a deep bilateral cervical block. An 80 mm. needle is now introduced through the wheal below the mastoid, pushed subcutaneously along the posterior border of the sterno-mastoid muscle, and 10 c.cm. of 0.5 per cent. novocain injected along its middle third. This blocks those nerves that become superficial at that point—namely, the great auricular, the small occipital, and the transverse cervical. The anaesthesia induced is almost instantaneous, and lasts two or two and a half hours. No adrenaline is added to the novocain solution if the condition is a toxic goitre.

There were 106 cases in which cervical anaesthesia was induced. The results in 83 (78.3 per cent.) were good; in 6 (5.7 per cent.) poor; in 10 (9.4 per cent.) fair. In 2 cases (1.9 per cent.) the anaesthetic was "intended combined"; in 5 (4.7 per cent.) "necessarily combined"; in 5 (4.7 per cent.) there were reactions.

INGUINAL HERNIA.

After complete reduction of the hernia, a wheal is raised in a line from the anterior superior spine to the umbilicus, at a distance of three fingerbreadths from the anterior superior spine. A 50 mm. needle is inserted toward the umbilicus subcutaneously. When it has been introduced almost its entire length a wheal is raised, 0.5 per cent. novocain and adrenaline being used. The needle is now withdrawn to the first wheal, and pushed forward at an angle of 30 degrees to the skin. At the moment when it is felt to pierce the anterior rectus sheath, 2 c.cm. are injected. The manœuvre is repeated at angles of 60, 75, and 90 degrees to the skin. The 50 mm. needle is now completely withdrawn, the syringe refilled and reinserted through the wheal previously raised at the extremity of the needle's first subcutaneous insertion. Through this wheal solution is injected just as before, under the anterior rectus sheath as far as the umbilicus. The needle is again completely withdrawn and reinserted through the first wheal. This time injections are made toward the anterior superior spine, after each 2 or 3 c.cm. injection, increasing the angle the needle makes with the skin, until finally it is at right angles to it. Each injection of 2 or 3 c.cm. is made after the point is felt to pierce the external oblique aponeurosis. As a result the ilio-hypogastric and ilio-inguinal nerves will be completely blocked. A wheal is now raised over the superficial abdominal ring, at about the point where its pillars meet. The cord being raised from its bed is injected with a 50 mm. needle inserted through the wheal, 10 c.cm. of 0.5 per cent. novocain being used. The cord will be felt to swell as a result. Lastly, the 50 mm. needle is reinserted through this wheal between the cord and median line, and 10 c.cm. of novocain injected deep into the cord at its emergence from the superficial abdominal ring. In from five to fifteen minutes there is a complete anaesthesia of the surgical field, excepting the neck of the sac, and a duration of the anaesthesia of one hour may be expected. The neck of the sac is injected when the external oblique aponeurosis has been divided. It is quite possible to inject it before operation, but not without unnecessary risk.

There were 38 cases of inguinal hernia. The results in 27 (71.1 per cent.) were good; in 3 (7.9 per cent.) poor; in 3 (7.9 per cent.) fair; in 1 (2.6 per cent.) "intended combined"; and in 4 (10.5 per cent.) "necessarily combined."

LAMINECTOMY.

Regional anaesthesia is of great value in this operation. The position of the patient renders the administration of a general anaesthetic difficult. The operation is usually a lengthy one and the patient a poor subject for such prolonged inhalation anaesthesia. Under regional paravertebral anaesthesia the shock, as measured by blood pressure

and pulse, is slight. In the Mayo Clinic the results with regional anaesthesia have been better than with nitrous oxide or ether. The patient lies prone with the table angulated at his waist, the apex of the angle pointing upwards. His head rests on a horseshoe rest, through which he looks towards the floor. If laminectomy of the seventh dorsal vertebra were to be performed, paravertebral anaesthesia would be induced from the third to the tenth dorsal spine. A dermal wheal is raised 3 cm. to the right of the third spine, and an 80 mm. needle introduced at right angles to the skin. The resistance it encounters is the transverse process of the fourth dorsal vertebra. It is now withdrawn a little and pointed upward until it has passed the transverse process a distance of 1 cm. It will now touch the third dorsal nerve, and paraesthesia at this stage, while not sought intentionally, means later deep anaesthesia. An injection of 4 c.cm. of 1 per cent. novocain and adrenaline is made at this point. The manœuvre is repeated on the other side of the third spine. In the same way each pair of dorsal nerves is injected, down to the tenth. It is often necessary to wait forty-five minutes before anaesthesia is complete. The process is hastened, and in unfavourable cases made more successful, by infiltrating the post-vertebral muscles with 0.5 per cent. novocain. Experience has shown that infiltration of these muscles alone is often unsuccessful. The area is tendinous and the solution does not run. A combination of paravertebral anaesthesia followed by infiltration shows far better results than either method used alone. As much as 200 c.cm. of 1 per cent. novocain with 100 c.cm. of the 0.5 per cent. solution may be given. In this, as in all regional anaesthesias, the ideal amount of anaesthetic is that which produces anaesthesia without a reaction. If the laminectomy is in the cervical region, then the nerves are best reached by the technique described for bilateral deep cervical block. If the laminectomy is in the sacral region, then the method employed is as detailed under the heading of sacral anaesthesia.

There are 25 cases in which regional anaesthesia in laminectomy was induced. The results in 17 were good; in 4 poor; in 2 fair; in 2 the anaesthesia was "necessarily combined"; 1 showed reaction.

CRANIAL EXPLORATIONS.

When craniotomy through the occipital bone is to be performed, a lateral deep cervical block is followed by a superficial cervical block at the posterior border of the sterno-mastoid, just as described for operations on the thyroid, except that 1 per cent. novocain is used for the superficial block. If anaesthesia does not develop quickly and completely, the neck is next infiltrated from the external occipital protuberance downward to the vertebra prominens, and the scalp along the superior curved line of the occiput, out to each mastoid. It is essential to infiltrate thoroughly, for not only does fluid run badly in the thick post-vertebral musculature, but the great occipital nerve at its origin as the posterior primary division of the second cervical nerve lies nearer to the median line than to the transverse process of the axis, and may be missed in the lateral deep cervical block, in which the pools of novocain are deposited at the tips of the transverse processes on the floor of the posterior triangle. From these pools the posterior primary division of the second cervical nerve is shielded by the complexus and splenius. The above technique gives an insensitive and bloodless field for the usual crossbow incision.

There were 4 cases in which regional anaesthesia was induced for posterior craniotomy. The results in 3 (75 per cent.) were good, and in 1 (25 per cent.) poor.

REGIONAL ANAESTHESIA IN THE ABDOMEN.

Little need be said on this subject. The question of the path of pain from abdominal viscera is not settled. Labat's technique is based on the theory that the splanchnic nerves provide the greater part of the route; Meeker has expressed himself very emphatically in disagreement. Moreover, that degree of success has not been attained with abdominal anaesthesia which would entitle it to a place among those

manœuvres which have been shown, beyond reasonable doubt, to be of real value. Discredit can only be brought on a rational method of anaesthesia by its too ardent application to a region to which it is very questionably suited.

A modification of Labat's method was used in 32 cases, with good results in 11. Of these, 4 were partial gastrectomies, 3 gastro-enterostomies, and 1 a choledochotomy. It is impossible to be sure, however, just how much of the result was due to the anaesthesia of the abdominal sympathetic nerves, which Labat's method induces.

The most important result of regional anaesthesia is demonstrated rather by experience than figures. It is that in almost all cases the patient is the better for his regional anaesthetic, and even if inhalation anaesthesia is also needed, the patient is held with a minimum of nitrous oxide or ethylene often sufficient only to abolish consciousness.

REACTIONS TO REGIONAL ANAESTHESIA.

These are easily induced unless strict watch is kept on the patient and the various signs noted. It was the rule in all the cases of the present series for a nurse to sit at the patient's head and record the pulse. In head, spinal cord, and abdominal cases she also took the blood pressure. All these were recorded on a sheet of paper which the administrator could see and so avoid alarming the patient by verbal inquiries. The nurse also engaged the patient in conversation and withdrew his attention from the manipulations.

A reaction may be due either to the adrenaline injected or to the novocain, or both. An adrenaline reaction is early, a novocain reaction late. The elements of an adrenaline reaction in the order of their appearance are: (1) increased respiration, (2) rapid pulse, (3) palpitation, (4) apprehensive excitement, (5) tremor, (6) sweating, (7) dyspnoea, and (8) precordial pain. The last two, unlike the others, are late in onset. Any three of the first six constitute a marked reaction; the last two are happily as rare as they are serious. The elements of a novocain reaction are those of spinal anaesthesia: slow pulse, fall in blood pressure, pallor, cyanosis, nausea, and vomiting.

The treatment for either type of reaction is that of prevention. Safety is ensured by slow injection and cessation as soon as the reaction appears. The effect wears off in a few minutes. It is not cumulative and injection may proceed after an interval. In the event of a severe adrenaline reaction, oxygen containing 5 per cent. of carbon dioxide is given. This relieves the air hunger and anginal pain. More than 30 minims of adrenaline should never be given to one patient. There was only one severe adrenaline reaction in the present series. That was in the case of a patient who was afterwards found to have a family history of capillary atonicity. Both blood pressure and pulse rate were abnormally low, and his type would now be considered unsuitable for regional anaesthesia.

An ampoule containing 3 grains of caffeine, 7 grains of sodium benzoate, and 0.025 grain of strychnine should be in readiness in the event of a severe novocain reaction. For severe cases of pallor, nausea, and slow pulse, from 5 to 10 minims of adrenaline are injected.

A certain measure of success may be attained by practice of the technical methods herein detailed. To improve on that and to reduce failure to a minimum, careful study of the anatomy of the region is essential. It is necessary to visualize the field in perspective, and to be prepared for those variations from normal topography and relations which are not to be dealt with by rule of thumb.

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NODAL FEVER.

(ERYTHEMA NODOSUM, ERYTHEMA MULTIFORME.)

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PRELIMINARY.

IN 1905 I published a book which bore the title *Nodal Fever*; quite recently Dr. G. F. Walker of Leeds has asked for my present views on this subject, and I will here sum up the results of further observations made during the past two decades. With respect to my *parrum opus* I may mention that, although the criticisms were very complimentary and friendly, the general verdict was the Scottish one of "Not proven."

Briefly stated, my contention was that erythema nodosum is not merely an affection of the skin, but an acute specific fever, met with, and best studied, in ordinary general practice. Evidence was adduced to show that it had a distinct prodromal stage, a stage of eruption, and a period of convalescence; that relapses occurred, and that second attacks had been noticed after an interval of several years. The theory advocated by Dr. (afterwards Sir) Stephen Mackenzie nearly forty years ago, that it is a manifestation of rheumatism, was combated; an explanation of the arthritic symptoms was suggested; and Trousseau's dictum that erythema nodosum is a distinct disease from erythema papulatum was disputed. Finally, I ventured to rename the disease "nodal fever" (*febris nodosa*).

My attention was first directed to this complaint when I graduated in 1879. I was attending at the time a brother, aged 16, whose attack as regards the copiousness of the rash, the degree of the accompanying pyrexia, and the prolongation of convalescence, was as severe as any I have ever seen since; it was something very different from the mild cases I had observed in hospital out-patient practice. I settled in Adelaide in 1883, and during the next seven years met with thirteen more cases. In 1886 I was struck by the coincidence of two cases of erythema nodosum occurring in the same household at the same time, but did not regard it as more than a coincidence. In the following year I had a child, aged 4 years, under my care for several days with a mild feverish attack, and had suspected typhoid fever because of its prevalence at that time; when it turned out to be erythema nodosum, the resemblance of this prolonged period of malaise and pyrexia to the ordinary prodromal stage of many of the acute specific fevers immediately struck me, and the chain of evidence seemed fairly complete. These observations were confirmed in subsequent cases, and in 1890 I wrote a paper¹ entitled "Erythema nodosum, an acute specific fever." The volume *Nodal Fever*, based upon 63 cases, appeared fifteen years later, and was merely an elaboration of my former paper.

In this present communication it is proposed to deal with the subject by showing the general resemblance the symptoms and course of nodal fever bear to other acute specific fevers, by bringing forward fresh evidence pointing to its infectious nature, and by discussing its suggested relationship to other diseases, and the views thereon of other writers.

STATISTICS.

The first point to which I would draw attention is the age incidence (excluding cases seen in the Children's Hospital); there were—

Under 10 years ...	...	...	...	...	13
Over 10 and under 20 years ...	...	...	...	...	34
" 20 " 30 " ...	...	...	...	...	30
" 30 " 40 " ...	...	...	...	...	13
" 40 " 50 " ...	...	...	...	...	3
" 50 " 60 " ...	...	...	...	...	2
" 60 years ...	...	...	...	...	1
					96

Roughly speaking, 94 per cent. were under the age of 40 years and 6 per cent. over that age. If we accept 14 years as the average age of puberty in both sexes, and