muscle never so displaced from its original position, or be it even separated into parts so that one part remains dorsal and the other migrates to a ventral position, the primitive nerve supply is found to remain. The constancy is so marked that anatomists confidently reverse the process of search and discover the primitive origin of an obscure or anomalous slip of muscle by tracing its nerve supply. Mendel's hypothesis requires the overthrow of this stability of nerve supply.

3. The work of Gaskell⁸ has shown that cranial nuclei are of various orders; they are of three orders homologous with the nuclei easily demonstrated in a spinal segment. There are: (1) Ventral median nuclei of large cells giving rise to somatic efferent nerves; (2) lateral nuclei of smaller cells giving rise to visceral efferent nerves; (3) dorsal connexions of afferent nerves. As I have shown embryologically, the facial musculature is derived directly from the spiracle musculature; it is a "visceral" muscle, it had in its earliest inception a "visceral" innervation arising from the facial complex nucleus, a "visceral" nucleus which belongs to the second order of nuclei of Gaskell's classification. Mendel would shift the original innervation from its original visceral nucleus to the third and twelfth nuclei, which are of the large-celled ventral somatic order, and quite different in medullary position and anatomical character. Such requirements as these three are so revolutionary that they would require the most definite proofs before they could be accepted, and these proofs have never been found; as Gowers⁹ writes: "For evidence of these hypotheses (of Mendel) we have still to wait."

It may be asked: Why has Mendel's hypothesis held the field so long? The reasons are not far to seek: (1) The primitive origin of the facial musculature was unknown; (2) the hypothesis formed a most plausible explanation for many otherwise obscure cases of paresis. It did not, however, explain all difficult phenomena, for example, the curious congenital anomaly of "jaw-winking" or synergic movement of mouth and eyelids first observed by Gunn¹⁰ in 1883; but once the primitive origin and nerve supply of the facial musculature was demonstrated, the meaning of this oddity was apparent, and I could bring conclusive evidence to show that the phenomenon was a reappearance of a remote ancestral habit.¹¹ The features of these cases of jaw-winking have been most admirably illustrated in a recent number of the JOURNAL by Mr. Beaumont of Bath.¹²

In my first paper read to the Ophthalmological Society I called attention to the work of Edinger,¹³ in which he had described the facial nucleus in a manner different to that usually held. As students we were taught to regard most of these cranial nuclei as so many plums in the medullary pie, which, were they big enough, we could extract with our thumbs as easily as did little Jack Horner pull out a plum from another pie! Some are truly isolated clumps of cells—for example, the fourth and sixth, and these are simple because they supply, in man, a single slip of muscle. The greater number of them, however, are chains of nuclei, as we recognize easily enough in the case of the ninth and tenth nuclei; and Edinger similarly describes the seventh nucleus as forming a chain of nuclei extending some distance in the medulla, and not forming, as too many erroneously believe, a single clump. It is the longitudinal position of the nucleus which is the clue to these coincident paralyses of eye muscles innervated from the third nucleus and the orbicularis palpebrarum from the seventh, or of the muscles supplied by the twelfth and of the so-called orbicularis oris of the seventh. A lesion in the region of the third nucleus may involve the neighbouring dorsal part of the seventh, or one in the region of the twelfth nucleus may affect the not far distant ventral and inferior portion of the seventh nucleus.

The editorial in September put the position excellently so far as observations from clinical cases go. On the one hand there is Mendel's hypothesis with a host of cases explained on that hypothesis by Tooth, Turner, Beever, Taylor, Jackson, and others; on the other hand there are more recent cases of van Gehuchten, Marinesco, and particularly that of Parhon and Minea, where a paresis of the upper facial muscles was proved to be due to a lesion of the dorsal part of the seventh nucleus and where the third nucleus was healthy.

The clinical observations leave the matter in a balance of probabilities: One set of clinical cases can be set over

against another set. For most it is not possible to verify clinical observations of this kind at first hand, for the cases are rare. But in the anatomical researches I have given there is an absolute basis of fact—that is, there is a series of observations which it is possible for any one to examine for himself at any time, and so far as our clinical work is concerned the demonstration of anatomical facts is the only basis of rational medicine.

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SUBCUTANEOUS INJECTIONS OF AIR AS A MEANS OF RELIEVING CERTAIN PAINFUL MANIFESTATIONS.

By ALFRED S. GUBB, M.D., M.R.C.S., Etc.,

AIX-LES-BAINS AND ALGIERS.

SOME years ago Dr. Cordier, the well-known Lyons surgeon, read a paper before the Société des Sciences Médicales on the therapeutical application of interstitial injections of air. His plan having been brought to my notice in the course of a consultation with Dr. Curtillet, the Director of the School of Medicine at Algiers, I have since employed it in a number of cases, with results that may be deemed worthy of being placed on record.

The method suggested itself to Dr. Cordier at the time when elongation of nerves was in vogue as a means of relieving the pain in obstinate cases of neuralgia, more particularly in sciatica. It occurred to him that it might be possible thus to produce elongation of the finer nerve ramifications where they leave the subcutaneous tissues to enter the derma proper. He had hoped in this way to introduce a new mode of treating certain skin diseases; in this he was disappointed, but incidentally he discovered a means of affording relief in painful manifestations of which sciatica may be taken as the type.

His plan was to distend the tissues by the insufflation of air beneath the skin, and the purely mechanical action of the distension was proved by the fact that the results were approximately the same whether plain air, oxygen, hydrogen, nitrogen, or carbonic acid gas was employed. The only difference observed was in the comparative rapidity with which they underwent absorption. With the experience of many hundred injections, he states that the injections are perfectly innocuous, that they require no special apparatus or appliances nor even any special operative dexterity, and that in a whole series of painful affections they yield results often very satisfactory and sometimes really remarkable.

The procedure is simplicity itself. The pumping apparatus is supplied by an ordinary rubber bulb provided with an elastic reservoir such as is used for Paquelin's thermocautery, a length of rubber tubing in which is inserted a glass bulb filled with sterilized cotton and an iridio-platinum needle. The latter is sterilized just before use by heating in the flame of a spirit lamp. The fingers of the operator and the skin of the patient must of course also be sterilized. It is well to have an idea of the cubical capacity of the bulb in order to know how much air has been introduced.

Having taken these preliminary precautions, the needle is plunged through the skin over the seat of the pain, then, after waiting a few moments to see that no blood exudes, showing that the needle has not entered a blood vessel, the insufflation is commenced. This should be done gently, very slight pressure sufficing to overcome the elasticity of the skin. A rounded swelling forms round the seat of puncture, and when the air reaches a vascular or nervous sheath it rapidly spreads along it, and secondary swellings may form at a distance. These secondary ramifications are specially apt to form in the limbs, where the sheaths are more numerous. The skin at first becomes blanched, but this soon gives place to a pronounced redness which persists for some hours. The air takes several

days to undergo complete absorption, and under the influence of muscular contraction travels far and wide, so that the characteristic crepitation of "surgical emphysema" may be felt at spots distant from the seat of the original injection. No pain whatever is experienced, even when comparatively large quantities of air are injected, at most a sensation of distension, "pins and needles" or pin pricks. Cutaneous sensibility is at once diminished; the skin becoming more or less numb.

The needle having been withdrawn and the puncture sealed by a drop of collodion, the next step is to massage the part. The subcutaneous air must be alternately dispersed and brought together again, especially over the painful spots. This massage is an indispensable part of the procedure, and must be conscientiously carried out, indeed patients should be directed to repeat the process daily as long as any resonance remains.

The procedure is applicable to the relief of pain due to all forms of neuralgia and neuritis. The only precaution is to vary the quantity of air injected according to the anatomical structure of the part. For instance, we may inject 200 or 300 c.cm. of air in the gluteal region, while over the thorax from 10 to 30 c.cm. will be enough. In the neuralgic pain that follows extensive zona it is best to make several small injections, one over each painful spot. In intercostal neuralgia one small injection behind near the vertebral column should be made, and another in front, about 2 in. from the middle line.

In the treatment of sciatica the injections should be made in the lumbar region, on the outer side of the thigh and on the supero-external part of the leg, round about the head of the fibula, as well as over any painful spots in the lower part of the leg and the dorsum of the foot, to be followed in every instance by systematic massage.

The only forms of neuralgia which I have not so far ventured to treat by this method are those of the face, though there is no obvious reason why, in cases that prove refractory to the action of analgesics, it should not be employed. In this situation, however, 3 or 4 c.cm. of air should suffice.

In no instance has any mishap attended this mode of treatment, although it has now been practised many thousand times, so that it may safely be affirmed to be devoid of risk. Nervous patients, especially women, occasionally complain of a feeling of constriction in the neck when the air finds its way into that region, but the sensation is very fugitive and never amounts to serious inconvenience.

My personal experience includes 11 cases of sciatica, several of them being severe and of some months' standing, and in only one case did the result fall short of my expectation, the patient being a highly neurotic elderly woman, who came to Aix-les-Bains for the treatment of arthritis deformans and acute sciatica. Even in that case some relief followed each injection, five in all, but the pain recurred a few days later. I have often found it necessary to repeat the injections, but never more than three times, except in the case just referred to.

I have also treated several cases of neuritis of the brachial plexus, 2 in the acute stage, and very marked relief, which was maintained so long as the muscles were kept at rest, was afforded. Tempted by the absence of pain some of the patients resumed the use of the arm and provoked a return of the pain, though in a milder form.

Dr. Anastaze, of Affreville, has kindly placed at my disposal notes of several cases incorporated in an essay on the subject, which are interesting, inasmuch as they are derived from various sources:

CASE I.

Girl, aged 18, had suffered from sciatica for two years; walking was almost impossible; the muscles of the right thigh were atrophied. Attacks of severe pain often supervened at night. No history of gonorrhoea, malaria, or syphilis. She had been in hospital for three months under Dr. Moreau, and most antineuralgic remedies had been administered without affording relief. The sciatic nerve was then stretched (by flexion) without any result. Dr. Curtillet, under whose care she then came, decided to try injections of air by Cordier's method. Some 2,000 c.cm. of air was injected into the gluteal region on the affected side, and at once the patient said she felt much better; she passed a more comfortable night, and on the following day she was able to walk. The improvement continued; she was kept in hospital for three weeks until the air was completely absorbed, by which time she was well enough to return to her work.

CASE II.

Young woman, aged 24, who came in with symptoms of dry pleurisy. Injections of air were made at both ends of the costal arch—500 c.cm.—and the pain, which had resisted subcutaneous injections of morphine, at once disappeared.

CASE III.

Man, aged 45, under the care of Dr. Binet, had suffered from sciatica for seven years. Could only walk with the greatest pain and difficulty. Massage, counter-irritants, and the administration of analgesics having failed to relieve, Cordier's method was resorted to. A first injection of air was made in 1905, not followed by massage, and no relief was experienced. He returned early in 1906 and injections of air were made over two of the painful spots, one over the point of exit of the nerve, the other on the outer side of the thigh. The parts were then well massaged for a quarter of an hour. The patient was at once relieved, and although he had been carried to the hospital he was able to walk home. There has been no recurrence of the sciatica.

CASE IV.

Man, aged 28, had been under treatment for severe sciatica for six months at the Municipal Infirmary without benefit. One injection of air determined immediate relief, and he was able to return to his work.

CASE V.

Man, aged 39, admitted to the Civil Hospital under Dr. Vincent, April 22nd, 1903, with sciatica on the left side. Had been suffering for several months from more or less severe lumbar pain. The pain was paroxysmal, and was increased by movement, extending down into the leg and foot. Had been unable to leave his bed for several weeks previous to admission. On admission he could scarcely drag himself along by the aid of crutches, and was unable to sit down. On April 23rd two litres of air was injected an inch or so below the gluteal fold, and this penetrated the connective tissue of the whole limb, even to the toes. The patient complained of a slight burning pain. Five minutes' massage. The next day he was able to get up, and could walk with comparative ease. Within a fortnight the pain had entirely disappeared without any other injection, and he was discharged cured on May 7th. The patient was seen some time later, and had not had any return of the sciatica.

CASE VI.

Mr. S., officer in the army, aged 48, had been disabled by sciatica for two months. He had undergone every kind of treatment without benefit. He was quite unable to walk about the house, and had to be carried upstairs. A first injection of air was made by Dr. Cochez in the gluteal region (about half a litre), followed by energetic massage to bring the air over the painful spots. He was at once able to get up, walk, and even go upstairs, to his extreme surprise. The following day the pain, though much less severe, was still present, so massage was resorted to daily. A week later a second injection was made over the three painful spots, one in the gluteal region, another on the outer aspect of the thigh, and a third on the posterior surface of the calf. Some 1,500 c.cm. of air was injected in all, followed by massage. No immediate improvement followed, but three or four days later he was able to go out on horseback. The injections were repeated on three other occasions at a week's interval. Five weeks after the first injection he reported himself as quite cured, and he has since had no return of the affection.

CASE VII.

Madame J., aged 42, had been suffering for several months from severe intercostal neuralgia following an attack of left dorsal and abdominal zona. The pain was intense, hampering respiration and preventing sleep. No treatment had done her any good. In May, 1905, she was advised by Dr. Curtillet to undergo the treatment, and on May 25th Dr. Cochez made a first injection of air at the angle of the left scapula, about three-quarters of a litre being insufflated. This was followed by energetic massage and the patient said she felt much improved. She passed a good night, but after a day or two the pain recurred though in a milder form. A second injection was made a fortnight after the first, this time in two spots, one at the angle of the scapula, the other in front, under the left breast. Half a litre of air was injected in front and three-quarters of a litre behind. Ten minutes' massage. This time the pain disappeared for good and when seen a month later the patient declared herself in perfect health.

CASE VIII.

Madame Z., aged 55, addicted to the use of ether, had sustained a severe burn over the back of the right forearm. Cicatrization took a long time, and, later on, the scar became covered with a bullous eruption followed by the formation of scabs. At the same time she complained of severe pain in the scar. The pain became extremely severe, and, although every conceivable treatment was tried, no measure of relief was experienced. It was therefore decided to try what the injection of air would do. An elastic ligature was applied above the elbow and half a litre of air was injected below it by Dr. Cochez, the air being made to travel all over the forearm by massage, more particularly beneath the scar. A few hours later the pain became less severe, and the patient passed a better night. Massage was repeated night and morning for

several days. The scabs covering the scar were shed, and did not re-form. The scar itself became smooth and looked less angry. In view of these results the injection of air was repeated once a week, and the patient made steady progress towards complete recovery. She described herself as quite well after two months' treatment.

CASE IX.

The patient, aged 44, a confirmed alcoholic, presented suppurating perforating ulcers on the soles of both feet, associated with severe pains. He was admitted to the service of Dr. Salège, where Dr. Aboulker injected two litres of air into the right leg, followed by energetic massage. The ulcers on both feet were dressed antiseptically. The pain on the right side subsided at once, and twelve days later the ulcer on that side had quite healed, the other ulcer having remained in the same state. Encouraged by this result, the treatment was repeated on the other side, and the success was equally rapid and well marked. The patient was seen a year later, and said he had had no return of the pain.

These cases extend the scope of the treatment, and the almost uniform success that followed the injections suggests the propriety of employing the treatment for the relief of other painful manifestations than those referred to here.

SEVENTY-FIFTH ANNUAL MEETING

OF THE

British Medical Association

Held at Exeter, July 27th, 29th, 30th, and 31st, and
August 1st and 2nd, 1907.

PROCEEDINGS OF SECTIONS.

SECTION OF PATHOLOGY.

Professor ROBERT MUIR, M.D., F.R.C.P.E., President.

A DISCUSSION ON PERNICIOUS ANAEMIA AND ALLIED CONDITIONS.

OPENING PAPER.

By WILLIAM HUNTER, M.D. Edin., F.R.C.P. Lond.,

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THE SPECIFIC INFECTIVE NATURE OF ADDISON'S ANAEMIA: ITS COURSE AND TREATMENT.

INTRODUCTORY.

THE officers of the Section have given a wide range to the discussion by the title they have selected for its subject. By this title they have—as I think wisely—left it quite open to those taking part in it to contribute whatever class of observations—etiological, clinical, anatomical, haematological, diagnostic, prognostic, or therapeutic—that may serve to throw any light on the real "pathos" of the severe disease termed "pernicious anaemia." For in truth there is much "pathos" connected with every aspect of this remarkable disease; with the confusion and controversy connected with its earlier identification and observation by English and German observers respectively—without its equal in the history of any disease; still more pathos connected with the nature of the disease itself—its pathology, its clinical features, and pernicious course.

To be struck down sometimes quite suddenly in the midst of perfect health by a fell disease, mysterious in origin; to have strength sapped day by day by symptoms that possess, it is stated, no distinctive features, but are merely the result of the anaemia; to be suddenly restored to health, in many cases in the most marvellous manner—so much so that the patient often states he has never felt so well in his life; and then, after a period of three, six, or nine months, to be again suddenly reduced in a period of a few weeks to a condition of the most extreme bloodlessness and weakness such as no other disease displays; throughout these remarkable vicissitudes to be deprived

even of the comforts of hope by having your anaemia termed "progressive and pernicious"—such represents some of the pathos which must be taken account of in determining the true character of this most remarkable disease and its relations to other allied conditions of anaemia which, however closely resembling it in one or other of its features, differ from it profoundly in their total clinical characterization, especially in respect of their fatality. (See Chart 1.)

In dealing with the disease such as is here outlined, what avails it to tell either yourself or your patient that, desperate as is his anaemia, mysterious as is its source, it nevertheless does not essentially differ pathologically from other simpler forms of anaemia, such as "tapeworm anaemia," which can be cured in a few weeks; that it is simply due to the malignant direction taken by his blood formation, and to a reversion of his blood to an embryonic type; that its chief feature is a megaloblastic degeneration of his red cells, "the discovery of which in his blood often requires great patience, careful searching over several slides of blood with the aid of an oil immersion" (Ehrlich)?

Such an explanation is, indeed, a pathological one, inasmuch as it adds immeasurably to the "pathos" of the disease. But by itself it avails nothing, either to the patient or to the observer. Even if true, the problem still remains to explain why, in his particular case, the blood-forming powers of a man formerly healthy should so suddenly and completely have gone to pieces in the first instance, why they should so marvellously recover themselves in a few months, and why they should again, without cause, revert to their embryonic type.

I desire, then, to emphasize here, at the outset, more than has hitherto been done in connexion with the pathology of this disease, the importance of prognostic considerations in gauging the real pathos—the true pathology—of these anaemic conditions. I am therefore glad that the general title selected for our discussion is wide enough to include considerations of *Prognosis* and *Treatment*, as well as the narrower ones of *Morbid Anatomy* or *Haematology* usually associated with the title of pathology. The number of representative workers on anaemia present to take part in this discussion is a guarantee that all aspects on the subject will receive adequate attention:

The character and significance of the bone-marrow changes by Professor Muir, whose studies are, in my judgement, the most extensive and most conclusive on the subject; the blood changes, by Professor Lorrain Smith, whose original observations regarding the changes in the volume of the blood form the most important contribution regarding the blood changes during the past ten years; by Dr. Lovell Gulland and Dr. Melland regarding the morphological changes of the blood, to which, following Ehrlich (1892), so many observers attach a too exclusive importance; Dr. Robert Hutchison regarding the anaemias of childhood; Professor Ferguson and Dr. Boycott regarding ankylostomiasis anaemia; Professor Walker Hall on general metabolism in pernicious anaemia.

THE UNITY OR PLURALITY OF ADDISON'S ANAEMIA.

I may best contribute to the purposes of the discussion by confining myself more particularly to the great problem of the unity or plurality of that condition first described by English observers under the title of "idiopathic anaemia"—a problem which continues to divide observers into two great and hostile camps. My own observations on the subject extend over twenty-one years of work, and may be grouped under two headings: (1) The character of the observations on which the conclusions were based, as described by other observers (1888-1903); and (2) the character of the conclusions formed, summarized by myself. For and against the individuality of this admittedly most severe and fatal of all forms of anaemia, I shall illustrate and summarize by the aid of lantern slides of the observed lesions, curves and charts, and series of schematic tables.

The character of the observations have been in succession experimental, anatomical, clinical, chemical, diagnostic, and finally etiological, bacteriological, and historical. The pathological observations of the last seven years, regarding the significance attached to the infective lesions subsequently to be described, are based