As my further experience of this drug has been consistently satisfactory, and as most of my 70 cases, mainly uncomplicated extractions, were uniformly successful, I need not enter into their details; but I had two very instructive failures:

CASE XVII.

This patient had an alveolar abscess in connexion with a somewhat loose tooth. I could not inject much of the fluid without causing considerable discomfort. This was an early case. I have since improved my technique. Under similar circumstances, I would first anaesthetize the gum by applying to it a 10 per cent. solution of novocain before I began the injection.

CASE VIII.

This patient, aged about 55, had always hitherto had nitrous oxide gas. I injected novocain around the left inferior first molar, which I then extracted absolutely without pain. Two days later he wished to have a left inferior second bicuspid root removed in the same way. I injected novocain into the gum around it. The tissues were loose from inflammatory changes, and fluid penetrated easily and some escaped by the adjacent empty socket. The patient wished he had had "gas."

I had previously observed that on injection with novocain the gum became blanched and of a cheesy consistency. Neither of these changes were observed in Case VIII. I consider them to be the index of successful application, for they show that the drug has concentrated its action at the site of injection, and has not become diffused through the tissues or absorbed into the lymphatics. I would never now attempt an extraction in absence of blanching of the gum.

In no case in which I have used novocain have I had the slightest anxiety about the condition of the patient; there has been no shock, fainting, perspiration, nor collapse, and the patients have felt no after ill-effects. Where possible I advise the patients to take food before the extraction, because I think that after food they are in a condition better able to resist shock. From my experience, I am of opinion that where novocain fails to anaesthetize a part it is owing to imperfect application of the drug. When the gum is swollen from inflammatory exudation, it is most difficult to get the blanching and cheese-like consistency. The same difficulty may be experienced where the gum over the alveolus is unusually thin. My procedure is as follows:

1. I give the patient half a pint of warm carbolic lotion with which vigorously to wash out the mouth so as to reduce its septicity.
2. The all-metal hypodermic syringe (with vulcanized "vela" rubber packing), needle, glass measure, glass mortar, glass mixer, are all placed in hot water to raise the temperature to that of the patient.
3. If the patient is neurotic, a swab containing a 5 per cent. solution of novocain is put on the gum for five minutes, so as to render the latter insensitive to the insertion of the needle.
4. One or two novocain suprarenin tablets, each containing $\frac{1}{4}$ grain of novocain, are dissolved in 33 minims of hot water to make either a 1 or 2 per cent. solution respectively.
5. Hot water is passed through the syringe and needle, the novocain solution is drawn up into the syringe, and the syringe inverted to allow the air bubbles to rise into the needle, from which they are easily displaced by pressing the piston.
6. If an upper tooth, for example, is to be extracted, the needle is inserted into the gum $\frac{1}{4}$ in. above the cervical margin, and a drop or two of the novocain solution is forced in; I keep the needle in position a few seconds to allow the anaesthetic to act before forcing any more fluid into the tissue. After forcing in the solution the needle should not be immediately removed, because if this is done then, owing to the pressure being greater in the gum than outside, some of the fluid will escape. If the position selected is a good one (between the roots is better than over them), the gum will gradually blanch and become the consistency of cheese; the needle should then be removed and again inserted just inside the periphery of the blanching, and so on, till the whole of the gum on both sides of the tooth is anaesthetized. I do not hurry the injection, but take about three to five minutes for the process. The tooth can then be extracted. I have so far

never used more than three tablets (1 grain novocain) at one sitting.

I use an all-metal syringe with a solid piston of uniform diameter throughout its length. It is called the Imperial syringe, and can be obtained at the dépôts. The packing should be vulcanized "vela" rubber, not leather. The needles are boiled immediately after using, and kept in absolute alcohol till again required. They are screwed on to the nozzle of the syringe with a wrench, so that the junction is very tight; by this means fluid cannot escape at the junction of needle and syringe, as it usually does in most of the other syringes. For painless injection a Schimmel needle is almost a necessity. It is as superior to the ordinary hypodermic needle as the new tooth forceps are to the old. I make up my solutions fresh for each patient; there is no safety in a stock solution.

In conclusion I might summarize the advantages of novocain as follows:

1. It produces a perfect local anaesthesia.
2. The duration of the anaesthesia is longer than that of cocaine.
3. Even in strong solutions it does not irritate the tissues.
4. It is at least equal to cocaine in anaesthetic power.
5. It is many times less toxic than cocaine, in comparison with which it can be used in larger doses with perfect safety.
6. It is very constant in its action.
7. It does not produce shock, cardiac or respiratory failure, after-pain, nor sloughing of the gum.
8. It can be given immediately after food.
9. It is not a secret preparation, but a substance of known and definite chemical composition.
10. It is cheaper than most proprietary anaesthetic preparations.

I do not say that novocain should always be used in preference to "gas"—in children and in hypersensitive patients "gas" has obvious advantages; but on the other hand where patients are afraid of "gas," where from the physical condition of the patient or from any other cause "gas" is contraindicated, or where the extraction is likely to be prolonged, and the solution can be perfectly injected, I think that the safest and most perfect of known local anaesthetics should be used, and that drug, in my opinion, is novocain.

REGENERATION OF NERVES WITH REGARD TO THE SURGICAL TREATMENT OF CERTAIN PARALYSES.

By C. J. BOND, F.R.C.S.,

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I HAVE read with much interest the report in the BRITISH MEDICAL JOURNAL of April 27th by Mr. Basil Kilvington on an investigation on the regeneration of nerves with regard to the surgical treatment of certain paralyses, in which, after describing experiments on animals, he refers to the surgical possibilities of intraspinal nerve crossing, and records an attempt to carry out intraspinal anastomosis in the human subject, which unfortunately, owing to the presence of cicatricial tissue, had to be abandoned.

Mr. Kilvington's observations, founded on experimental work, appear to me to be a valuable attempt to open up a new line of treatment, and one affording further possibilities of benefit in cases of a hitherto peculiarly hopeless character; and in connexion with this subject I wish to record the following facts:

On March 29th, 1904, I performed the following operation on a patient at the Leicester Infirmary. A man, aged 46, had been struck in the back by the buffer of an engine twenty days previously, and sustained a fracture dislocation of the lowest dorsal and first lumbar vertebrae, with crushing of the cord and complete paraplegia. Laminectomy was performed, the neural arches of the last two dorsal and first two lumbar vertebrae being removed, and the dura mater laid freely open. Finding that (as was expected) the cord was completely divided, and acting on a previously-considered plan, I divided the last dorsal nerve-roots intact above the crush on the right side as low down as possible before their exit through the theca, and also similarly divided the first lumbar nerve roots intact below the disorganized portion of cord, also within the thecal canal, and turning these latter upwards I united the cut

proximal ends to the cut proximal ends of the dorsal nerve-roots previously divided, thus—

A corresponding junction was also made in the left side. It was hoped that by so doing a path might be provided for the possible transference of nerve impulses—afferent, efferent, and trophic—across the gap caused by the crushed portion of the cord.

The patient recovered from the operation and the wound healed. He remained in the hospital until June 24th, when he left for his home, where he died seven weeks later, and unfortunately no *post-mortem* examination was obtained. During the three months of his stay in the hospital there was no evidence of any return of voluntary movement, though there was a transitory alteration in the level of the anaesthetic area. The bladder condition remained as before.

I have not previously recorded this case as I felt that some preliminary experimental observations on animals were necessary. These Mr. Kilvington has now undertaken.

I am of course aware that the operation performed by him on dogs was undertaken with the object of establishing a direct connexion between the cord above the level of the sacral nerves and the peripheral nerves innervating the bladder and rectum, and that successful innervation of these viscera was thus brought about. The question arises whether, in addition to the possibility of successfully re-establishing this direct innervation of viscera in the human subject, it may not be possible by nerve anastomosis to provide a by-pass for the transference of nerve currents from the portion of cord above the crush to that below and vice versa. The question of the position of the nerve section and anastomosis in reference to the posterior root ganglion is, as Mr. Kilvington points out, very important. In my case the nerves were joined within the thecal canal.

MORPHINOMANIA TREATED SUCCESSFULLY WITH ATROPINE AND STRYCHNINE.*

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DURING the past year I have been treating a case of morphine habit of over thirty years' standing, and as I believe that he is now completely cured I think that a description of the case and the treatment pursued may interest you.

He made his first acquaintance with the drug through joining an opium-smoking club in London, and soon began to appreciate the brilliancy and activity of thought that it caused, and then to use it systematically to further him in business. In about four years the craving had become established. He made many voluntary efforts to free himself from the habit, but without success; on one occasion he placed himself in the hands of a medical man, who relieved the craving to a certain extent, but in about a year and a half he broke down again. He also became an alcoholic in his endeavours to stave off the stage of depression, but during the past few years he found that alcohol had not the desired effect, often making him even more depressed, and so he has taken less than formerly.

His usual allowance of opium latterly had been two wineglassfuls of laudanum in the day, and when he had to get on without it he felt intensely irritable, restless, and miserable. He slept wretchedly, he says hardly an hour in the twenty-four, and that little disturbed by flashes of light, sounds of bells, and by people coming up the

stairs and into his room, and, when he was very bad, close up to his bed, causing him intense terror.

His appearance was not typical; instead of being emaciated and having a pale, pasty complexion and dilated pupils, he was stout, indeed somewhat corpulent, had a high rather congested colour, and his pupils were contracted though not to pin points. His expression was wild and staring, his gait shuffling and uncertain, and his manner restless; intention tremors were present in writing and other fine movements, and he was subject to short lapses of memory. His disregard for his appearance and dress was like that of the chronic drunkard, and he was hardly able to earn sufficient to keep him from want. When I first saw him he had been without opium for a fortnight, he was intensely miserable and depressed, had been practically without sleep for some nights, and had intense headache. He told me that if I could not give him relief from his misery there would be nothing for him but to do away with himself.

What books I have been able to consult on the subject agree that the essentials of treatment are complete rest, careful dieting, thorough supervision and gradual withdrawal of the opium.

In this case none of these were available; he was in lodgings where I could not exercise any control or supervision, he had to work for his scanty living, and, as I found out a couple of months later, was often in want of the bare necessities of life during treatment.

The drugs recommended are many and varied and of widely differing physiological action, such as strychnine, cannabis indica, valerian, caffeine, bromides, sodium phosphate, atropine, and coal-tar derivatives. I had read in Dr. McBride's article on the treatment of alcoholism, published in the BRITISH MEDICAL JOURNAL in April, 1904, that he considered the hypodermic administration of atropine and strychnine to be beneficial in the treatment of morphinomania as well as of alcoholism, and, as it had proved successful in my hands in the treatment of alcoholics, I determined to give it a trial in this case.

I began with atropine sulphate $\frac{1}{100}$ grain and strychnine nitrate $\frac{1}{60}$ grain three times a day, increasing as rapidly as he would bear, till on the eighth day he got atropine sulphate $\frac{1}{60}$ grain and strychnine nitrate $\frac{1}{60}$ grain, but I had to reduce the atropine to $\frac{1}{100}$ grain in a short time. I also prescribed a cinchona mixture, but he did not take this regularly or for long.

The treatment benefited him immediately, and the first thing he noticed was relief from headache and improvement in his rest at night. The effect here was curious and interesting; he had been disturbed and frightened by sounds of bells and by people entering the room and coming close to him. After the first day the bells sounded fainter and the people only came to his door; the next night he hardly noticed the bells and the people seemed to be on the stairs, the next night in the hall, and then they ceased to trouble him. By the fifth day he felt a distaste for alcohol and was distinctly less miserable, and by the fourteenth day had not the slightest desire for opium, was quite hopeful, and beginning to take some interest in his appearance; his gait also had improved; he had lost the wild, staring expression, and was getting two to three hours' refreshing sleep at night.

It is recommended that opium should be withdrawn gradually in order to avoid as far as possible the usual distressing attacks of vomiting and diarrhoea. In this case it had been withdrawn suddenly and completely, and on the fourth day of treatment he complained of nausea and vomiting, and the next day of diarrhoea. These caused him great suffering as time went on; he was sometimes disturbed eighteen and twenty times during the night, and the vomiting was so violent as to cause haemorrhage. His weight diminished rapidly, and at one time he became so weak that I was somewhat alarmed at his condition.

Morphinomaniacs are said to bear atropine better than alcoholics, but I did not find it so in this case. Early in June I reduced the dose of atropine, and on June 20th stopped it altogether, but kept up full doses of strychnine for some time longer on account of his weak condition. By the end of June he was putting on weight again, his memory was improving rapidly, he slept soundly for about four hours each night (nearly his normal amount), had lost all abnormal depression, and took some pride in

* Read before the South-Eastern of Ireland Branch of the British Medical Association.