2. THE VALUE OF NOVOCAIN AS A LOCAL ANÆSTHETIC FOR SUBCUTANEOUS USE

By J. W. Struthers, F.R.C.S.Ed., Assistant Surgeon to Leith Hospital

There are now known a number of drugs, more or less closely allied to one another, which have the power of paralysing nerve terminals or interrupting the conductivity of nerve trunks so completely that they may be successfully used to induce local anaesthesia for operative purposes. The most recently discovered of these is a synthetic product which has been termed novocain. Various advantages over similar drugs have been claimed for it, and it has in a short time attained great popularity, particularly in Germany, where it was discovered, or perhaps one should say elaborated, by Einhorn, and is now prepared in the laboratories of a well-known chemical firm. During the last few months I have made use of novocain clinically for inducing local anaesthesia by subcutaneous injection, and as I have found that the claims made for it seem well founded, I thought it might be of interest to members of the Society if I indicate briefly the evidence which my experience has afforded.

My remarks are based on some eighty-six cases in which I have used novocain and carefully noted the results, contrasting them with those obtained from the use of cocaine and eucaine in some hundreds of similar cases. These results have been uniformly good, and although the number of cases may seem a small one to base an opinion on, I am inclined to believe that novocain is at least of equal and probably of greater value as a local anaesthetic than cocaine or eucaine for subcutaneous use.

In the first place, I may say that the drug is very soluble, and that its solutions are stable and may be repeatedly sterilised by boiling without in the least losing their power of inducing anaesthesia. I have tested this by making up a large quantity of a stock solution and using it over a period of several months, sterilising it over and over again during that time. The solutions combine well with solutions of adrenal preparations, and do not in the least interfere with the vaso-constrictor action of the latter.

For subcutaneous use, one requires, speaking generally, two solutions of a local anaesthetic—first, a relatively weak one for use in quantities up to several ounces, to produce anaesthesia by direct infiltration of the field of operation; second, a relatively strong one for injecting into or round nerve trunks such as the ulnar or
median nerves, to produce what is termed reginal anaesthesia in the area supplied by the nerve concerned.

For infiltration anaesthesia I have found that a solution of novocain in 0.75 per cent. saline solution of the strength of 1:400, plus 1 drop of the ordinary 1:1000 adrenalin solution to every 2 or 3 drms. of solution used, the strength of solution originally recommended by Braun,\(^1\) answers admirably. It corresponds to what may be termed the standard solution for infiltration of 1:1000 cocaine, but has this advantage, that it may be used in larger quantities; for while the limit of safety is reached when about 4 oz. of the cocaine solution have been used, at least 6 oz. and probably more of the novocain solution may be used for an adult without any risk. In addition to this, it diffuses readily and acts as quickly as the cocaine solution, anaesthesia being satisfactory in ten to fifteen minutes after the injection is complete, and for this reason novocain is to be preferred to eucaine, for the latter may take as much as half an hour to take full effect. The duration of the anaesthesia is always more than an hour, often as long as three or four hours. After it has passed off, there is often, as with other drugs, a variable amount of burning and smarting pain in the wound, and I have seen no reason to infer that this is either greater or less than with cocaine, eucaine, etc. Sloughing of the skin, which occasionally follows the use of local anaesthetics, particularly, I believe, eucaine and stovain, I have never seen, nor have I seen it reported after the use of novocain.

I have used infiltration anaesthesia with novocain adrenalin solution of the strength indicated in the following operations:—

Tracheotomy, skin grafting, application of actual cautery, plastic operation on eyelid, exploration of sinus for foreign body, relief of paraphimosis. Removal of—testis, varicocele, tunica vaginalis for hydrocele, prepatellar bursa, olecranon bursa, carpal ganglion, fatty tumour, angioma, congenital mole, sebaceous cysts, varicose veins of leg, adenoma of breast, small subcutaneous fibrosarcoma, tubercular ulcers.

The list is, I think, fairly representative of the class of operations which may suitably be done under local anaesthesia with success. A number of them have been done several times, and the total number has afforded a satisfactory test of the efficacy of novocain for infiltration anaesthesia. Several of them, it may be mentioned, were done in children as young as five and six years of age. In no case

\(^1\) Braun, "Die Lokalanästhesie," Leipzig, second edition, 1907.
was there any sign of toxic symptoms arising from the use of the novocain adrenalin solution.

For regional anaesthesia a 2 per cent. solution of novocain with 2 drops of \(1:1000\) adrenalin chloride solution to each drachm of solution used, is necessary when nerves as large as the median at the wrist or the ulnar at the elbow are being dealt with.

For anaesthetising digits by Oberst's method, the 2 per cent. solution may be used with perfect safety, but a 1 per cent. solution with adrenalin as before has been found quite strong enough to paralyse the relatively small digital nerves.

If a ring of this solution is injected round the base of a finger or toe into the subcutaneous tissue, the entire digit distal to the injection will be found anaesthetic in ten minutes. It was formerly the custom to apply a rubber band to the finger to localise the anaesthetising solution. The addition of adrenalin to solutions for inducing local anaesthesia, with the resulting anaemia and localisation of the anaesthetic action, has rendered the application of the rubber band unnecessary, and it is now never used.

The use of a local anaesthetic for anaesthetising digits by this method appears to me to afford perhaps as ready and accurate a method of comparing the relative strength of various drugs clinically as we possess, for the conditions in many cases are almost identical, and a given quantity of any drug can be accurately injected in each case and the effect easily watched and estimated. While a \(\frac{1}{2}\) per cent. cocaine adrenalin solution is strong enough to anaesthetise a digit completely in ten minutes, a 1 per cent. novocain adrenalin solution is required to ensure anaesthesia in the same time. While one would, however, hesitate to use more than 4 drms. of a \(\frac{1}{2}\) per cent. cocaine solution, as much as 6 drms. of the 1 per cent. novocain solution may be used without any risk. In point of fact such a quantity of a 1 per cent. solution is rarely required.

It will be noted that the doses indicated have not been stated as so many grains or centigrammes of novocain, but in drachms or ounces of the solutions recommended for use. This has been done in order to emphasise the fact that in stating the safe dose of any local anaesthetic, the strength of solution used must always be indicated, for a given quantity of novocain, cocaine, or other drug is much less toxic in a weak than in a strong solution. The actual amount of novocain suggested as the maximum dose in 1 per cent. solution is just over 3 grs., while the amount in the \(\frac{1}{2}\) per cent. solution is over 6 grs.
As regards the use of novocain for inducing regional anaesthesia, I have used it with success in opening whitlows of all degrees of severity, for the removal of ingrowing toe-nails, of subungual exostosis, for the treatment of hammer toe by excising the head and part of the shaft of the first phalanx, for amputation of fingers at and distal to the metacarpophalangeal joint, for removing needles and other foreign bodies embedded in the hand or fingers, for the cleansing and stitching of severe lacerated wounds, etc.

It has proved as satisfactory for regional as for infiltration anaesthesia, and, in conclusion, I may say, that I believe the advent of novocain marks a real though perhaps slight advance in the possibilities attending the use of local anaesthesia by subcutaneous injection. It is stable, readily sterilised, unirritating, and efficient as a local anaesthetic when combined with adrenalin, and can apparently be used in doses to meet all requirements without any fear of serious toxic symptoms arising.

3. CLINICAL REMARKS ON TUBERCULOUS CHLOROSIS

By Alex. James, M.D., Ed., F.R.C.P.Ed., Consulting Physician to the Edinburgh Royal Infirmary

When we meet with a case which presents in a more or less marked degree all the ordinary appearances of chlorosis, and which yet on examination of the blood reveals the number of red corpuscles and the percentage of haemoglobin to be practically normal, we are very likely to find in it a history of past or present tuberculous disease. This condition, often occurring in young women, is one which long ago Trousseau recognised and called false chlorosis or tuberculous anaemia; and although in recent times, when blood examination has become more of a routine procedure, the co-existence in tuberculous disease of an anaemic appearance with a practically normal blood count is quite recognised, it seems to me that in cases apparently of chlorosis this possible association of tuberculous disease often passes for long unrecognised. Inasmuch as the recognition of such cases is important from the points of view alike of diagnosis, etiology, pathology, and treatment, I believe that the following are well worth recording.

Case I.

A. H., aged 16, a French polisher, was admitted to Ward 31, April 9, 1907, as a case of chlorosis. She complained of shortness