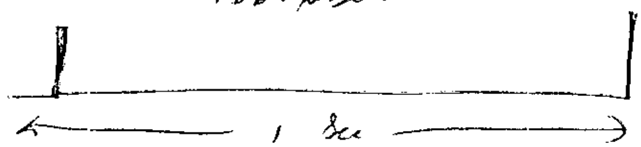
The requirements of pulse length were stated as 95 ms , 1 ms and 1 RS millivolts & 200 ms (100 / 2.2 / 500 MS)

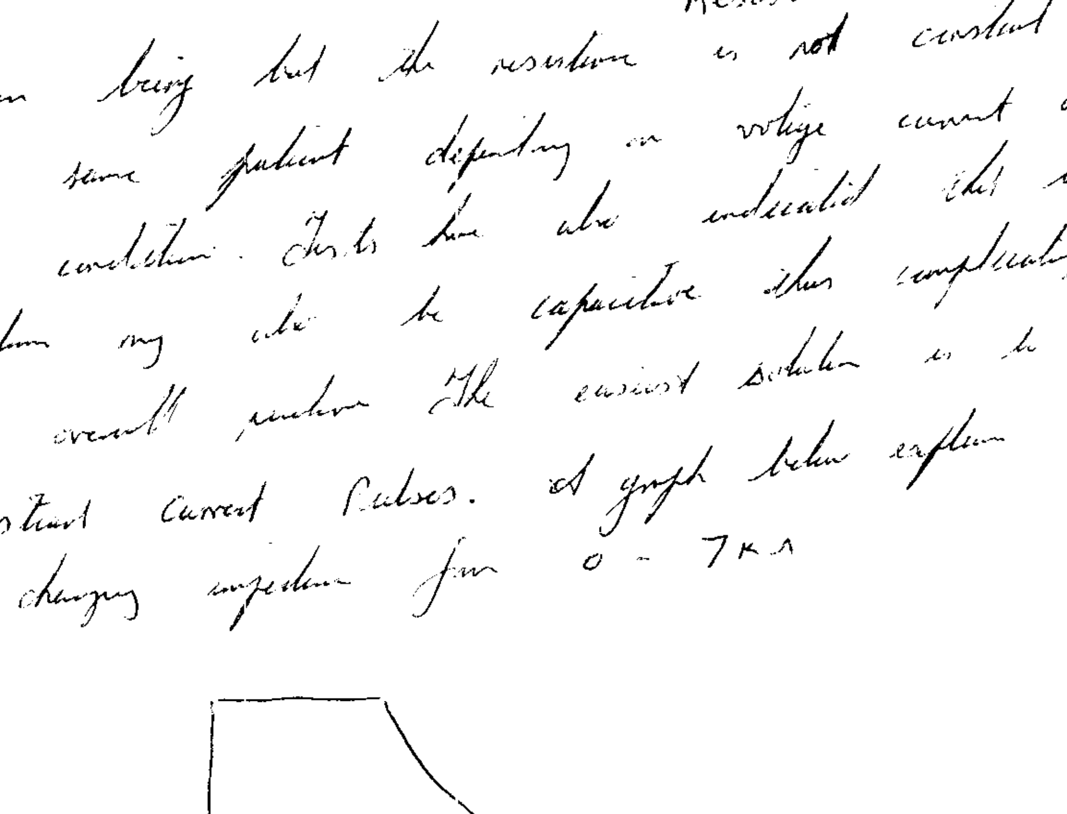
1 ms — 480 ... sec

at one 1 ms



In order to accurately determine the current flowing during the 1 usec pulse requires the accurate details of Pulse height and Pulse shape. Although not impossible it is extremely difficult and expensive and I would suggest you check any claim made in this area particularly at the lower levels of 1 - 2 mA (refer reports) less 1 mA.

Ohms law Amps = $\frac{\text{VOLTS}}{\text{Resistance}}$ applies to the human being but the resistance is not constant and can vary on the same patient depending on voltage current as well as skin condition. Tests have also indicated that the impedance may also be capacitive thus complicating still further the overall picture. The easiest solution is to generate Constant Current Pulses. A graph below explains the effect of changing impedance from 0 - 7KΩ



These are actual values and can be reproduced by any

The circuit used therefore generates a constant current which is only allowed to flow into the patient for 1 m sec every second etc. The digital readout measures this current accurately.

The max voltage available is 7V and will deliver 5 mA into a patient impedance of 1.4 K Ω.

The audio indicates that the patient leads are OK. ~~and~~ If for any reason the leads go very high impedance, the with lack of stimulus is obvious with the Audio Off the

The greatest fear of any ~~battery~~ directly driven system ~~not~~ as we not using a transformer as the Neurostim I, is a combination of short circuits allowing the battery voltage to appear on the electrodes giving D.C stimulation

The circuit used is inherently safe as does the time ~~requiring~~ ~~second~~ ~~continental~~ deliberately short circuit the the current is switched off we safely back up but also removes patient. This is not only charges ~~on the~~ allowing every pulse to ~~discharge~~ any patient capacitance be identical. The reading on the meter is therefore always the current delivered to the patient.

THE VIAMED ANAESTIM.

The Anaestim is a low power pulse generator which has been designed to aid the location of peripheral nerves during local or regional anaesthesia. The Anaestim is suitable for both sensory and mixed nerves, and can be used for nerve location in patients under anaesthesia provided that neuromuscular blocking drugs have not been used.

Functional description.

The Anaestim produces constant current pulses which, if transmitted to a peripheral nerve will lead to depolarisation and therefore stimulation of the nerve.
The duration of the pulses can be preset to 0.1, 0.2 or 0.5 milliseconds, at a frequency of 0.5, 0.66 or 1Hz.(30, 40 or 60 pulses/minute).
The output current can be preset from 0 to 5mA.

Technique for use of the Anaestim.

A). Conscious patients.

The red lead of the Anaestim should be attatched to a standard ECG monitoring electrode which should be positioned at a point remote from the site of the proposed local anaesthetic block. The black lead should be attatched to the needle to be used for the block, by means of the crocodile clip. (The Anaestim may be used with either insulated or uninsulated needles, which should be of as fine a guage as practicable, and have a short bevel).
The power level should be set to minimum with the output control knob.
The stimulator should now be turned on with the switch on the left hand side of the unit. This switch has two "ON" positions. Sliding the switch backwards simply turns the unit on. Sliding the switch forward to the "ON/AUDIO" position artivates circuitry which produces an audible bleep when current flows between the two electrodes. This bleep will only work when the needle has been inserted into the patient and serves as both an audible warning that stimulation is occuring, and as a disconection alarm.
The needle can then be inserted into the patient until its tip is in the subcutaneous tissues. It should not be advanced further at this stage.
The power level is then gradually increased until the patient can report unequivocal perception of the electrical pulses. The output power should then be fixed at this level.
The needle is then slowly advanced towards the nerve until the patient reports pulse synchronous paraesthesiae in the distribution of the nerve or visible muscle twitching occurs in the appropriate territory. The needle tip will now lie within a millimeter or two of the nerve. The needle is fixed in this position and a 2ml test dose of local anaesthetic injected. The strength of the perceived stimulus,or the amplitude of the muscle twitch, generally increases noticably in the next few seconds and then fades over the next 10-20 seconds. The full dose should then be injected, and the needle withdrawn. Typically the power output required is in the range of 1.5-4mA, although this varies considerably with individual patients and with different blocks.

B). Non-conscious patients.

In this situation it is not possible to use patient reported paraesthesiae as a guide to nerve location, but muscle twitching provides a good alternative. The nerve chosen must however contain motor fibres for this technique to be used, and neuromuscular blocking agents will obviously block the responses to the Anaestim.

ASTRA Astra Pharmaceuticals Ltd

15th July, 1988 SH/pjb/89

Dr. B.E. Smith,
Consultant Anaesthetist,
Alexandra Hospital,
Redditch,
Worcs.

Dear Brendan,

Many thanks for the excellent "Technique for use of the Anaestim II ('Astrastim') produced by you on our behalf and passed on to me via Jon Harrison.

We've taken the liberty of simplifying the details by separating each paragraph and numbering the steps to make life even easier. A copy of the 'finished artcile' is attached. Could you please review this and let me know if you are happy with the content and format, since your name and address feature at the end!

Once we have your approval we will take steps to have this printed for use with the Astrastim Nerve Locators, which are currently being loaned to a number of your colleagues throughout the U.K.

Many thanks for your assistance in this matter. We hope you have many years trouble free 'stimulating' from the Astrastim you received from Jon with our compliments!

Very best wishes

Yours sincerely,

Steve Hunter.

Steve Hunter
National Sales Manager
Pain Control Division

Enc.

c.c. Jon Harrison
J. Lamb, Viamed

THE ASTRASTIM

The Astrastim is a low power pulse generator which has been designed to aid the location of peripheral nerves during local or regional anaesthesia. The Astrastim is suitable for both sensory and mixed nerves, and can be used for nerve location in patients under anaesthesia provided that neuro-muscular blocking drugs have not been used.

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Technique for use of the Astrastim

A) Conscious patients

1. The red lead of the Astrastim should be attached to a standard ECG monitoring electrode which should be positioned at a point remote from the site of the proposed local anaesthetic block.

2. The black lead should be attached to the needle to be used for the block, by means of the crocodile clip. (The Astrastim may be used with either insulated or uninsulated needles, which should be of as fine a gauge as practicable, and have a short bevel).

3. The power level should be set to minimum with the output control knob.

4. The stimulator should now be turned on with the switch on the left hand side of the unit. This switch has two "ON" positions. Sliding the switch backwards simply turns the unit on. Sliding the switch forward to the "ON/AUDIO" position activates circuitry which produces an audible bleep when current flows between the two electrodes. This bleep will only work when the needle has been inserted into the patient and serves as both an audible warning that stimulation is occurring, and as a disconnection alarm.

5. The needle can then be inserted into the patient until its tip is in the subcutaneous tissues. It should not be advanced further at this stage.

6. The power level is then gradually increased until the patient can report unequivocal perception of the electrical pulses. The output power should then be fixed at this level.

7. The needle is then slowly advanced towards the nerve until the patient reports pulse synchronous paraesthesiae in the distribution of the nerve or visible muscle twitching occurs in the appropriate territory. The needle tip will now lie within a millimetre or two of the nerve.

../2

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8. The needle is fixed in this position and a 2ml test dose of local anaesthetic injected. The strength of the perceived stimulus, or the amplitude of the muscle twitch, generally increases noticably in the next few seconds and then fades over the next 10-20 seconds.

9. The full dose should then be injected, and the needle withdrawn. Typically the power output required is in the range of 1.5-4mA, although this varies considerably with individual patients and with different blocks.

B) Non-conscious patients

In this situation it is not possible to use patient reported paraesthesiae as a guide to nerve location, but muscle twitching provides a good alternative. The nerve chosen must however contain motor fibres for this technique to be used, and neuromuscular blocking agents will obviously block the responses to the Astrastim.

The stimulator is used in the same way as for conscious patients, but the output level can be set to maximum at the outset. When muscle twitching occurs the power level is reduced to that level that just produces twitching. The needle tip is then positioned to give maximal twitch amplitude which increases noticably if the nerve is touched or entered by the needle tip. The needle is then withdrawn slightly until the twitch amplitude just starts to fade. A 2ml test dose can then be given and results in a similar response to that described above. Any resistance to injection may indicate the needle tip lies within the nerve and the needle tip should be repositioned.

Choice of pulse length and frequency

For general nerve block the Astrastim should be set to deliver a pulse of 0.5mS duration at 1 second intervals. Shorter pulses may be more comfortable for some patients but this is an inconstant feature and must be left to a trial and error approach in any particular patient.

Dr. B.E. Smith
Consultant Anaesthetist
Alexandra Hospital
Redditch, Worcs.

ASTRASTIM Manufactured by:
Viamed
15 Station Road
Cross Hills
Keighley
West Yorkshire
BD20 7DT Tel: 0535 34542/36757