A novel, low-cost microsurgical nerve approximating device

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Purpose

To describe assembly of a simple nerve approximator applicable for use in microsurgery.

Background

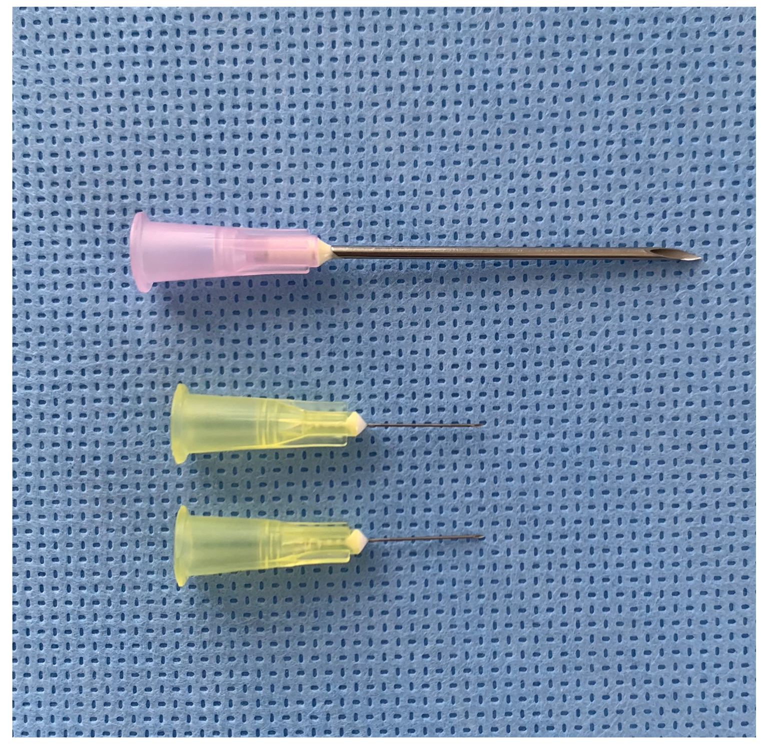
Timely primary repair of a transected peripheral nerve is the standard of care to achieve optimal healing, and functional outcomes (1). Important technical considerations when performing an end-to-end nerve repair include accurate approximation under minimal tension, and alignment of epineural blood vessels (1). A repair should be maintained with as few sutures as possible.

There currently exist several commercially available approximating devices to assist approximation and microsurgical nerve repair. The *Van Beek* nerve approximator is perhaps the most well-known, and takes its name from its inventor, American Plastic Surgeon Dr Allen Van Beek in 1980 (2).

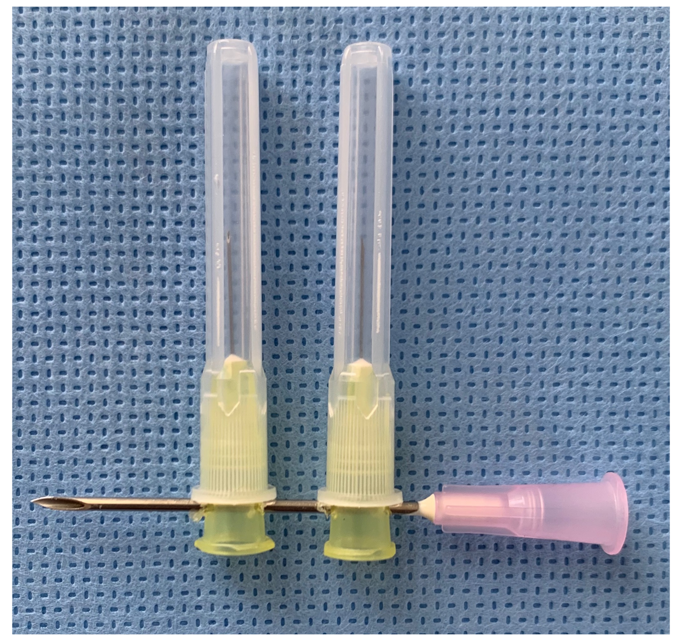
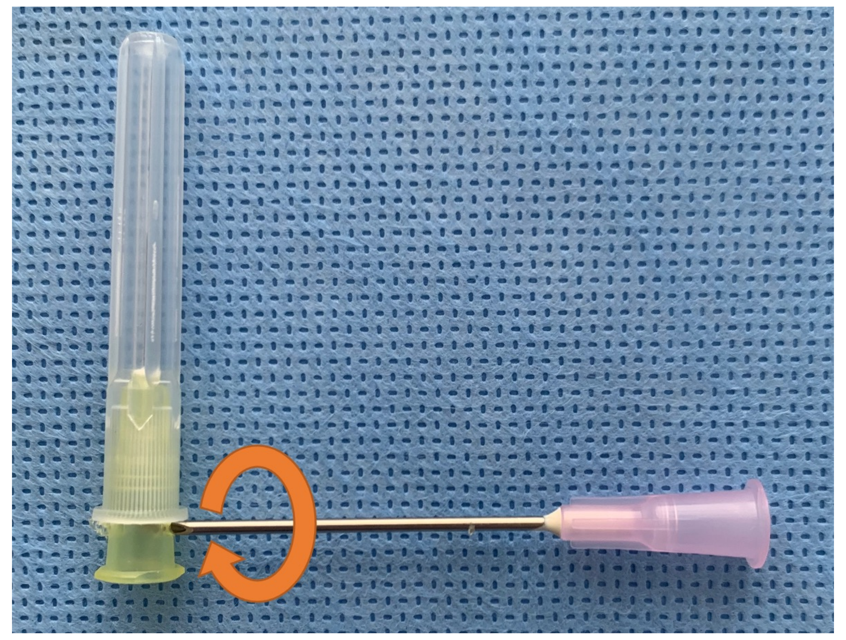
We describe a innovative approximator designed by the senior author (DR) than can be manufactured by any surgeon from readily available materials. While similar devices have been described using hypodermic needles and a syringe (3), the following description is novel.

Materials

The device consists of three sterile hypodermic needles. One 18G (pink) bevelled drawing up needle, and two 30G (yellow) needles.

Figures 1–4 (clockwise from top left)
Figures 1 and 2: Materials required for nerve approximator.
Figure 3: Passing the 22G hypodermic needle through the hub of the 30G needle in a circular motion.
Figure 4: Both 30G needles on the shaft of the 22G needle.

Construction

Over the instrument trolley, the 22G needle point is passed through the hub of each 30G needle sequentially.

A twisting motion should be employed to facilitate the movement of the bevelled needle through the hub. The 30G needles should remain capped during assembly to decrease the risk of a sharps injury. See images 1-4 above.

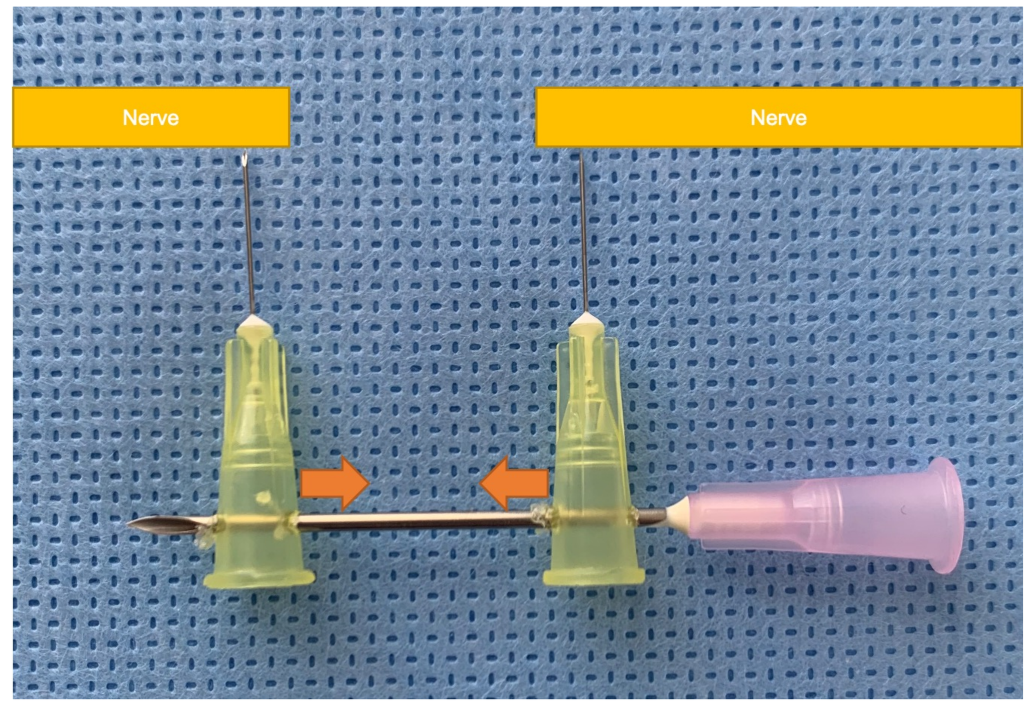
Technique

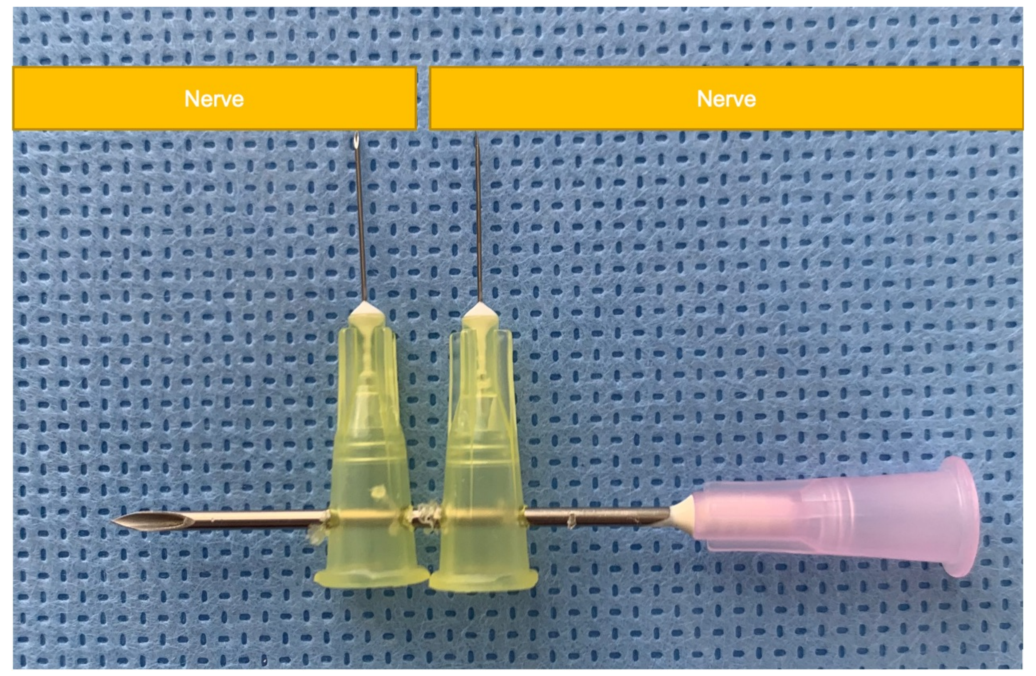
The 30G needles are passed through the epineurium or surrounding soft tissue of the prepared proximal and distal nerve stumps. The hubs of each are then slid towards one another along the shaft of the 22G needle, approximating the transected nerve ends (see images 5 and 6 to right). Suture repair of the nerve is performed, and the approximator can be slid out and the sharps returned to the instrument trolley.

Findings

This device both immobilizes and approximates the nerve ends whilst maintaining alignment to facilitate an optimal repair. It can then be turned (in a similar manner to microvascular cage clamp) to enable suture of the posterior nerve. We find that friction of the 30G needle hub on the 22G needle shaft is great enough to overcome distraction forces of the cut nerve ends.
Larger needles could conceivably be employed in tendon repair surgery.

The sterile materials required are readily available in all operating theatres, and the required assembly time is minimal. The cost of manufacture is negligible, especially when compared with commercially available devices, which are also liable to damage or being misplaced. At the time of publication, the cost of required materials is approximately AUD$0.22.
We find this device particularly valuable during single-operator microsurgery, or where an assistant is unable to hold the nerves in approximation.





Figures 5 and 6 (above)
Schematic representation of nerve approximation achieved on sliding the yellow needle hubs towards one another.

Conclusion

This innovative device enables accurate nerve approximation and alignment where commercial approximator is not available.

References:
1. Griffin MF, et al. Peripheral nerve injury: Principles for repair and regeneration. Open Orthop J, 2014; 8: 199-203.
2. Van Beek AL, et al. A nerve approximating device. Plastic and Reconstructive Surgery, 1980; 66(1): 143-147.
3. Bayramiçli M, et al. Nerve and tendon approximator. The Journal of Hand Surgery, 1997; 22(4): 743-754.

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