INTRODUCTION

Traumatic nerve injury and its repair or reconstruction are an integral part of hand surgery. Unpredictability and the critical time have been the hallmarks of results of Nerve repairs. Clinical and investigative modalities to confirm the success or failure of results take time, jeopardising the results of any secondary salvaging procedures in neural repair or reconstruction. This is in sharp contrast with the results of microvascular repair. Though there are several methods described in the literature in simulation of microvascular repair the same cannot be said about the micro neural repair. It will be unethical for the budding surgeons to acquire this expertise directly on the patient in clinical scenarios. This has been the major hurdle in the progress of this field of hand surgery especially in terms of imparting practical surgical knowledge for the young trainees in hand surgery. With the advent of the proximal and distal nerve transfers in the management of the patients with Brachial Plexus Injury, the art of peripheral micro neurosurgery and its training has acquired a new importance. An ideal stimulatory exercise in micro neural repair should not only mimic the technical challenges involved in the procedure but should also allow the trainees to evaluate their own techniques & methods. Apart from the tension at the anastomotic site the other important factor for a favourable outcome which is in the control of surgeon during repair is the ability of obtaining the coaptation of the fascicles. There are some attempts to address this aspect of training in the literature (1 2 ). However we think that there is need and a possibility to improvise on this aspect of surgical training. We the authors are describing a simple method of simulation of nerve repair emphasising the method of evaluating the fascicular coaptation following the repair.

METHOD

The method that is being described involves preparing the 2 conduits of desirable size using the sterile disposable hand towels available in operation theatres. The conduits are cut into a size of 2.5 cms to mimic the proximal and distal cut ends of nerve to be repaired. Three or four pieces of small hollow plastic tubes of length 2.5 cms obtained by trimming the middle thirds of the cotton ear buds to simulate the fascicles. Three or four such white coloured plastic tubes are inserted into one of the conduits (proximal segment) as shown in fig 1b and through the other conduit (distal segment as shown in fig 1a) the same number of different coloured plastic tubes are inserted to mimic the 2 segments of nerves for simulated repair. The 2 segments can now be transfixed using a nerve approximator (3) to suture the anterior wall as shown in fig 1c. The trainees are now allowed to bring about simulated repair keeping in mind the fascicular alignment. Once the anterior wall is repaired the frame may be flipped to repair the posterior wall as shown in fig 2a & b. The feel of the 8-0 or 10-0 needle and suture material passing through the partially stretchable material is almost similar to that of real nerve. The feel of knotting during repair also matches with that of real repair. Once the repair is complete we know use the Android flexible HD Camera with a diameter of 3.5 mm, working length of 2 meters and a working distance of 4mm and inbuilt 6 adjustable white LEDs to evaluate the degree of coaptation at the anastomotic site of the simulated repair. The flexible Camera is placed at a distance of 1-1.5 cms (till the images are properly focussed) from each of the white coloured plastic tubes as shown in fig 3a, and the image is captured on the laptop using the appropriate App as shown in the fig 3b. The overlap of the coloured circles on the white circles on the monitor, and the configuration of the overlap will give the evaluator an idea of the degree of coaptation. This can even be evaluated depending on the overlap as Grade 4 (100- 75%), Grade 3 (75-50%), Grade 2(50-25%), and Grade 1 (less than 25%) as depicted in the fig 4. It will thus be possible to evaluate the coaptation obtained for each of the fascicle in the simulated repair to assess the competence of the trainee. As the trainees advance in their competencies, the exercise can be made more complicated in terms of size of the fascicles by using the venflon catheter sheath instead of plastic tubes to reduce the size of the fascicle. One can also opt for mismatching or different sized nerve ends for repair simulating a nerve transfer. All these variations can still be evaluated using the same flexible HD camera.

CONCLUSION

The above described method of nerve repair is not only simple but also allows the evaluation of degree of coaptation of the fascicles following the simulated nerve repair.

REFERENCE


Figure 1 showing 3 fascicles contained in conduit (representing epineurium)
1a proximal – white coloured
1b distal – coloured
1c two cut ends mounted on nerve approximator ready for anastomosis of anterior wall.

Figure 2 showing nerve repair.
2a anterior wall repair
2b posterior wall repair.

Figure 3 evaluation of nerve repair using android camera.
3a focusing the camera on the proximal end.
3b image in the laptop monitor.

Figure 4 grading of the nerve repair according to degree of coaptation.

Grade I
Grade II
Grade III
Grade IV

Fig 1a Fig 1b Fig 1c
Fig 2 a Fig 2b
Fig 3a Fig 3b

Grade I
Grade II
Grade III
Grade IV