Ten Years’ Experience Using Tissucol in the Repair of the Brachial Plexus and Neighboring Nerves

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Abstract

During a 10 year period, starting in November 1980, a cylindrical tube of clotted plasma was used in 218 patients to join the trimmed stumps of 549 trunks, cords and nerves forming the brachial plexus or lying close to it, e.g., the spinal accessory nerve. Reconstruction was obtained by direct neurorrhaphy in a few cases and by neurotization and/or by autologous grafts in the vast majority of instances. The classical technique of interfascicular repair was slightly modified in order to diminish the quantity of connective tissue at the apposition site between the central and the peripheral stump. Whenever necessary 9/0 to 11/0 nylon superficial stay sutures were used to reinforce the junction. Muscular power was evaluated in 200 patients. The average age was 25.6 years and the average follow-up 15.14 months. Repair of spinal nerves, trunks and cords yielded. In 64 % of the patients the results were better than M2+, according to the Highet (MRC) score. Neurotization using the spinal accessory nerve and other cervical motor rami led to positive results in 75 % of the patients while only 57 % of the patients who underwent intercostal nerve repair improved. By contrast, 84 % of fair to good results with repair of various nerves close to the plexus, repair of the median and ulnar nerves being the least successful. Although a comparison between suturing and gluing was made, in such complex surgery it is not possible to demonstrate statistically the superiority of one method over the other. There was certainly a gain in operation time, and the sprouts crossed the junction's interface more easily so the total regeneration time was a little shorter. The quality of results are, however, the same after adequate follow-up. The reduction of failures witnessed when using fibrin sealant probably has to be attributed to the experience both surgeons involved in the study have gained during the additional 10 years of nerve repair.

Introduction

In the late 1960s, while visiting Great Britain, one of us (AN) saw that the fibrin clot method of Seddon [1] was still being used on rare occasions. The technique was said to not be very practical or reliable, and it looked less precise

1 Deceased on November 25th, 1993
than the microsurgical fascicular or fascicular group repair already introduced worldwide [2–7]. Participating in a brachial plexus symposium in Lausanne, Kuderna [8] demonstrated, as early as 1975, an improved fibrin sealant that produced almost perfect junctions. It took us, however, 4 years to overcome the prejudice against fibrin glue. Dr. Narakas started to use it, in the second half of 1979, for repair of peripheral nerves, introducing it for plexus repair in November of that year. In the beginning he applied it in every fifth patient. After registering the first favorable results, in the summer of 1980, Tissucol was adopted for neurosynthesis in every other case and from June 1981 it was used systematically in every instance.

This study concerns patients operated on by the authors only, either together or independently using the same techniques.

Methods

Tissucol

During the 10-years period of the survey the method for using Tissucol has varied. Initially 500 units of thrombin (NIH-U) and 3000 KIU/ml of aprotinin were applied. Later on, the fibrinolysis inhibitor was diminished to 300 and even to 100 KIU/ml to be increased again to 1000 in 1985, as it was learned that amounts of that order would not produce fibrosis while still ensuring stability and acceptable strength of repair. The preparation of grafts underwent also some changes; however, in the last 8 years it has hardly been modified. The steps of sealing with fibrin are described here in detail, as there are some differences when repairing big paucifascicular trunks or multifascicular nerves. In order to diminish the amount of fibrous tissue which impedes sprouts crossing the repair site, we isolated the individual fascicles inside the ends of the grafts, trimming them in a special way. They were cleaned from adventitial and epineural tissue, over a distance of 5–8 mm, with a very sharp ophthalmic blade or microscissors, leaving them exposed. They were then assembled to form a tight bundle of approximatively the same diameter as the cut surface of the fascicle or the fascicular group in the nerve trunk which they had to cover. Because of resection of nonnervous tissue, grouping of more fascicles was needed to reach the required section than when using a conventional cable graft. Indeed, almost twice as many were usually required to repair a given nerve segment, e.g., six to eight grafts were needed instead of three to four, as in standard interfascicular grafting. With extensive damage, the proper amount of graft could not always be obtained, even when harvesting both sural nerves, the medial cutaneous nerve of the forearm, including sometimes the sensory branch of the radial nerve. On certain occasions supplementary grafts could be gained from nerves originating in avulsed roots, e.g., the ulnar nerve in C7, C8, T1 root avulsion. In such circumstances the epineurium would be peeled off from the harvested nerve trunk to foster its revascularization. The epineurium was maintained when the ulnar nerve was used either as a pedicled graft or a free one, which was revascularized by a microsurgical anastomosis. In such cases, and when dealing with multifascicular structures particularly in sites