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LETTER TO THE EDITOR

Suture of Minimal-diameter Vessels Using Fingertip Support Technique

András Horváth · István Valálik · András Csókay

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Dear Sir,

During micro-surgical operations, complications may occur, which may endanger anastomoses. One of the basic factors is physiologic tremor, what is impeding the surgeon and the development of accurate sutures [1]. By using the fingertip support technique, the tips of the thumb, index- and middle fingers are supported on the fixed platform (bridge) which overpasses the operational area [2]. This bridge is commercially available in different shapes and sizes (Bethlehem-bridge) [2]. This technique may decrease the tremor by up to one third. Tese data have been verified with PAM tremorometry [2]. In plastic- and restorative surgery it is common to have to unify micro-vessels and nerves under diameter of 0.6 mm (finger-replantations, lobe-transplants). In such cases, decrease of high-level tremor can bring significant benefits in terms of operation result. During our measurements, we have searched, whether the significant tremor-decrease achieved by the fingertip support technique would enable us to create anastomoses with greater security. Furthermore we have analyzed, what is the vessel diameter, where this technique has to be used in order to create micro-vascular bypasses.

A chicken wing (artery) is an adequate in vitro model [3]. We have measured the perimeters on various sections. We specified the average diameter in the most proximal, most distal and middle sections in vitro. Following these measurements we have found that the two main arteries are on average 1.1 mm in diameter in the proximal, 0.54 mm in the middle, and 0.29 mm in the distal area. On these sections, we have created end-to-end anastomoses (in comfortable sitting position, 90° positioning of the elbows, towel-support under the arm) with 10.0 thread (Ethicon®-Prolene). At the beginning of the modelling, the operator (medical student) did not have any prior experience either in traditional micro-surgical procedures or in the fingertip support technique. The learning of the two methods and microscopic stitching techniques has happened at the same time. He has performed both in approximately equal numbers (ca. 100 times each) in 1.5 years of preliminary practice, before he started comparative measurements.

Afterwards, we have documented certain parameters we observed during the stitching of anastomoses including minimum and maximum times of stitching, knotting, the average of these values, and vessel ruptures have all been recorded. We have measured stitching time from the first penetration to the finishing to the last knot, and also knotting time from the beginning of looping to the cutting off of spare thread. We have classified all events as ruptures when the ends of vessels ripped in (from the edge of the vessel to the entry point of the needle), or were misplaced (donor and acceptor did not fit precisely, because one of the ends slipped under the other one. We have done 20 recorded procedures with each technique on vessels averaging 0.54 mm in diameter, and have compared the results. Furthermore, we have identified the vessel-sections that

A. Horváth
Semmelweis University Faculty of Medicine,
Budapest, Hungary

I. Valálik
Department of Neurosurgery, St. John's Hospital,
Budapest, Hungary

A. Csókay
Department of Neurosurgery, BAZ County Hospital,
Miskolc, Hungary

A. Horváth (✉)
36, Vincellér street,
Szekszárd 7100, Hungary
e-mail: andras.horvath.semmelweis@gmail.com

are inoperable due to the physiologic tremor causing overly frequent ruptures and where secure anastomoses cannot be created using traditional support technique. We have observed the possible accuracy on this section, and have recorded the parameters described earlier.

A high degree of difference has shown between the traditional support technique and the fingertip support technique in every recorded parameter. The stitching time was with 26, the knotting time with 23, the numbers of ruptures with 86 percent lower. We could not perform anastomoses using traditional support technique on vessels averaging 0.29 mm in diameter in 10 attempts. Using fingertip support technique the average stitching time through 10 attempts was 3 min 5 sec and the average knotting speed was 45 sec. Out of 10 anastomoses, 3 ruptures have occured.

It has been proven that under in vitro circumstances, the fingertip support technique can significantly decrease tremor, thereby decreasing operational time. Therefore, in situations where time is a critical factor (e.g. neurosurgery) it may be an important innovation. Furthermore, from the significant decrease in stitching time and the minimization of vascular ruptures, it is obvious that this technique yields a significant advantage over the traditional manual techniques in the more accurate placement of sutures and the secure and stable looping of knots. We would like to emphasize that under a certain diameter, this is the only technique that can be applied with confidence, hence in cases of operational procedures where the development of anastomoses of vessels with such properties is required, this may be the primarily chosen method.

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