



## Modified Continuous Loop Technique for microvascular anastomosis

Kumar P, Bhaskara KG, Thomas PC

Department of Plastic Surgery, Kasturba Medical College, Manipal 576 119, Karnataka, India

### Summary

A modified method of continuous loop technique for microvascular anastomosis is described. The handling of loop is easier & even last suture is placed under vision. This makes the microvascular anastomosis easier and simpler.

*Key words : Anastomosis, Microvascular continuous loop technique*

### Introduction

In pursuit of technical perfection and desire to develop simpler and quicker methods of microvascular anastomosis, various microsurgical techniques have been described for anastomosis after Carrel's trifurcation technique. The first author of this article has modified the continuous suturing technique in an attempt to achieve the goal of technical perfection and developing a simple method.

### Materials & Methods

The technique described was used in end-to-end anastomosis of 47 arteries and 60 veins in 47 patients operated in Department of Plastic Surgery, Kasturba Medical College, Manipal from Feb 1996 to Dec 2000 (Table I to IV) by the senior author.

### Operative techniques

The preparation of the vessel was carried out in the normal way. The two basic (primary) stitches were placed at 3 O'clock and 9 O'clock position (Fig 1). Then three secondary sutures were placed in the anterior wall to make two continuous loops

(Fig 1. suture 3,4 & 5). The first loop was kept smaller than the second. The thread of the first loop was cut and was converted into interrupted suture followed by similar treatment to the second loop. Two more sutures (Fig 1: suture 6, 7) were placed before third suture was tied and finally all these sutures were converted into interrupted suture. The approximator clamp was rotated by 180° and the posterior wall anastomosis was completed in the same manner (Fig 1).

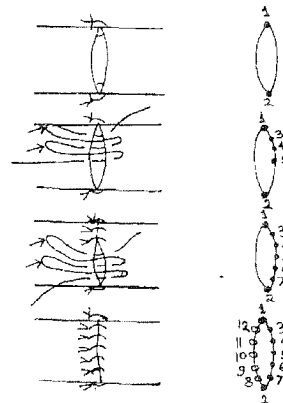


Fig 1. Continuous loop technique with limited number of loops upto the centre of each wall. After dividing the loops, the continuous suture is converted into interrupted sutures (Arrows indicate site of division of each loop). The remaining portion of the vessel is closed in similar manner.

The suture material used was 8 0, 9 0 and 10 0 depending on the size of the vessel and thickness of the wall. First knot was surgeon's knot.

Final closure of the wound was done by placing a corrugated rubber drain and an infant feeding tube for frequent (2 hourly) irrigation of the anastomosis site by 2% xylocaine without adrenaline in order to avoid vessel spasm. Irrigation in post-operative period for 48 hours, also, to some extent, decreases the chances of significant hematoma formation and helps in washing excess clotting factors present in the vicinity of the anastomosis.

## Results

**Age:** Max number of patients was between 26-40 yrs (Table 1).

Table 1. Age group

Age group (years)	No. of patients
0-20	8
21-50	31
>51	13

**Indications:** reconstruction following cancer excision constituted the largest group (27 patients) followed by trauma (17 cases). (Table 2)

Table 2. Timing of surgery

A) Elective free tissue transfer	Total 40
Neoplasm	29
Old trauma (infected)	7
Burns	2
Trophic ulcer	1
Diabetic foot	1
B) Emergency	Total 12
Replantation	7
Revascularization	5

**Region:** 21 anastomosis were done in head and neck region, 12 in upper extremity and 14 in lower extremity. (Table 3).

Table 3. Regional distribution of cases

Region	No. of cases
Head and neck	23
Upper extremities	13
Lower extremities	16

**Types of microvascular procedure:** Maximum number of cases included in the study had free tissue transfer (Table 4).

Table 4. Types of free tissue transferred

Free Tissue	No. of patients
Latissimus dorsi muscle/myo-cutaneous flap	25
Pectoralis major myo-cutaneous flap	1
Radial artery forearm flap	5
Fibula	2
Jejunum	2
Rectus abdominis	3
Toe to thumb	1
Antero-lateral thigh flap	1

**Types of free flaps:** Maximum number of cases had latissimus dorsi flap transfer (Table 4).

Table 5. Failures

Types of surgery	No. of failures
Free tissue transfer	6
Replantation	3
Revascularization	1

**Failures:** Free flaps failed in 6/47 (17%) cases (Table 5). Failures in our cases will be classified in two groups:

1. **Primary failure:** These failures start (onset) within few hours of the completion of anastomosis. This represents the technical skill of a surgeon, faulty operative technique including failure to achieve hemostasis and prevention of kinking of the anastomosed vessels. Since we consider primary hemorrhage in this group, we include all the failure within 48 hours in this group.
2. **Secondary failure:** This includes all those failure, which starts after 48 hours. This indicates faulty monitoring and management in the post-operative period. Unusually delayed failures (more than 7 days) are mostly due to infection or trauma at the anastomosis site.

Out of the 6 cases under present study, 3 had venous problems within 48 hrs (primary failures), one had venous problems after 7 days and remaining 2 cases necrosed on 10<sup>th</sup> & 14<sup>th</sup> post-operative days. Re-exploration was done in 4 cases with venous problems out of which one that was due to external compression by hematoma within 12 hours survived.

## Discussion

There are 2 types of sutures placed while anastomosing small vessel under magnification.

1. Basic guide or primary stitches: to avoid rotation and to minimize the problems of vessel size discrepancy
2. Secondary completion stitches to complete the anastomosis- In Carrel's trifurcation techniques basic guide sutures are placed 120° apart (1'O', 2'O' and 6'O' clock position)<sup>1</sup>. In other techniques two basic stitches are placed at 100 degree apart at 3 o' and 9 o'clock position<sup>2,3</sup>. To avoid the approximation clamp during anastomosis of posterior wall, the two basic stitches at 12 O' and 6 O' clock position has been tried by few authors<sup>4</sup>.

In the commonly used method of microvascular anastomosis, the secondary completion sutures are interrupted. Continuous sutures or its variants (continuous loop tech-

nique, "insert suture first and tie later" and "loops on hanger" suturing techniques) have been tried by various authors<sup>2, 5,6</sup> to improve luminal visibility during last few sutures. In continuous suture the learning curve is steep and adjusting the tension of the suture requires considerable experience<sup>3</sup>. Fibrin glue-assisted microvascular anastomosis that avoids need for secondary sutures may cause vessel narrowing and intravascular thrombosis<sup>7</sup>.

In spite of the fact that the microvascular surgery is performed relatively less frequently, our result suggest that our technique is quite satisfactory and differs in some important aspects from the technique of the other authors:

1. Handling of loops: Handling of loops is easy because only 3 sutures (2 loops) are applied at a time (unlike other continuous loop technique). For making identification and handling of loops further easier alternate loops may be made small and large. To avoid sticking of loops to the tissue and to avoid mixing with each other, loops are made smaller and as far as possible flooding the field with heparin is avoided.
2. Unlike continuous suturing technique, there is no chance of purse string effect.
3. Suturing under vision: Unlike interrupted suture technique, even the last suture is placed through full thickness of wall under vision. It means it maintains the advantages of continuous suturing.

It was very difficult to assess the accurate size of the vessel anastomosed during the study as the size changes with excessive stitching, under effect of xylocaine and after mechanical dilatation.

The handling of loops is easier with thicker (80') threads. The time taken was not compared to the interrupted technique of secondary completion suturing. Delay in total duration has been reported by Lin, but no

significant change in timing is expected because time saved in taking accurate sutures (due to bites under vision in continuous technique) will be equalized by extra time taken in handling and cutting the loops.

Failure in 3 cases that failed with in 48 hours was probably due to technical reason / post operative spasm and thrombosis of vein. One case failed after 3 days (re exploration revealed hematoma compressing vessels) and the two cases which failed after 10 days had developed severe infection.

This technique can be used to replace last few sutures of anterior and posterior walls in interrupted secondary suture techniques. If more than two loops are made at a time, alternate loops may be kept small and large for the purpose of easy handling. If irrigation is stopped during the making and division of the loops, loops made are smaller and field is gently mopped just before tying knots, the handling of loops becomes easier. when one develops enough expertise to handle loops, 4-5 loops may be made together to complete each side (anterior or posterior) of the vessel. (Fig 2) To keep the field favorable for anastomosis we place an infant tube in the dependent position (protecting the anastomosis site) and connect to the continuous low-pressure suction during the anastomosis.

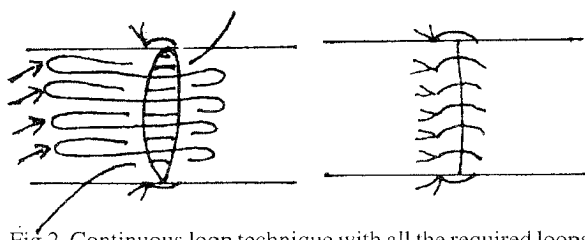


Fig 2. Continuous loop technique with all the required loops to close one wall (anterior or posterior) of the vessel are taken together. One by one all loops are converted into interrupted sutures (arrows indicate the site of division of each loop)

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## Authors

*Pramod Kumar* MS, MCh, DNB, Prof and Head  
*KG Bhaskara* MS, MCh, DNB, Assistant Professor  
*Paul C Thomas* MS, FRCS, MCh, Assist Prof  
 (at present working in Saudi Arabia)

## Corresponding Author

*Pramod Kumar* MS, MCh, DNB  
 Professor & Head  
 Department of Plastic Surgery  
 Kasturba Medical College  
 Manipal 576 119, Karnataka, India

Tel : (+91) (0) (8252) 71201 Ext 22286 (O),  
 22135 (R)

Fax : (+91) (0) (08252) 70062

Email : pkumar12-vip@zetainfotech.com  
 pkumar86@hotmail.com