

# Transoral Barbed Knotless Continuous Suture Technic for Oral/Oropharyngeal Defect After Cancer Ablation

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March 15, 2022

## Abstract

Key Points ? Transoral resection for oral cavity and oropharyngeal cancer has become popular. ? Transoral conventional interrupt knot tying suturing for oral/oropharyngeal defect often requires time. ? Transoral barbed knotless continuous suture could reduce operation time with a comparable complication rate. ? Knotless barbed suture provides appropriate tension and secure closure with multiple anchors. ? Transoral barbed knotless suture is particularly advantageous in deep and narrow areas.

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## 1 | INTRODUCTION

Repair of oral/oropharyngeal defects after transoral resection of oral cavity cancer is a critical step to prevent complications such as fistula, infection, and delayed adjuvant therapy.<sup>1</sup> Interrupted suturing has been used as the standard wound closure technique in these areas. However, there are often time-consuming difficulties in performing sutures in deep and narrow areas. The barbed suture with multiple anchors is an antibacterial, monofilament, absorbable suture. The barbed knotless suture without tying could reduce the operation time and close the wound with appropriate and consistent tension. It has been used for laparoscopic and endoscopic surgery,<sup>2,3</sup> as well as in high-tension areas such as the uterus and abdominal wall.<sup>4,5</sup> Recently, various surgical fields have employed barbed suture to achieve a shorter surgical time and secure closure with appropriate tension including in the nasal and oral cavities.<sup>6-9</sup>

In this study, we evaluated the efficacy of this device in closure of oral/oropharyngeal defects after transoral surgery for oral cavity cancer. We compared the suturing-time and suture-related complications between the barbed knotless continuous suture group and conventional interrupt knot tying suture group.

## 2 | Materials and methods

### 2.1 | Patient enrollment

This retrospective study was approved by the authors' institutional review board (Approval No. 2021-07-128). Forty patients were enrolled from April to December 2019, after surgery for oral cavity cancer by a single experienced surgeon. Patients were classified into two groups: the barbed suture ( $n = 27$ ) and

interrupt suture ( $n = 13$ ) groups according to method and material of wound closure. We used both in the early study period, but the barbed suture had been mainly used because the time sparing effect of the barbed suture was prominent. Clinical variables were age, sex, tumor location, type of surgery, suture site, T stage, tumor size, defect size, primary vs. salvage treatment, and reconstruction method.

## 2.2 | Outcome measurement

Clinical factors were compared between the two groups, and outcomes were analyzed according to suture time and complication. Suture time was measured during closure of oral/oropharyngeal defects. Suture times were compared according to site. Complications were categorized by wound dehiscence and foreign body sensation due to suture material at more than two weeks after surgery. The Mann–Whitney test was used to compare continuous variables, and categorical variables were analyzed with Fisher’s exact test. P-value  $< 0.05$  was considered statistically significant. Statistical analyses were performed using SPSS for Windows ver. 20.0 (SPSS Inc., Chicago, IL, USA).

## 2.3 | Surgical technique

All patients underwent oral cavity cancer surgery through an intraoral approach. Primary closure, regional flap, or free flap were performed according to location and size of the defects. We used the STRATAFIX Symmetric PDS Plus 4-0 (Ethicon Inc., Somerville, NJ) for defect closure in the barbed suture group (Figure 1). Suturing was started from the deep portion of the defect, such as base of the tongue or narrow space close to the teeth. We performed continuous running suturing and created a single knot at the start of the suturing. We cut the protruding end of barbed suture by pulling the stitch due to prickling sensation at 2 weeks after the surgery.

In the interrupt suture group, suturing also was started from the deepest portion of the defects using Vicryl (Ethicon Inc., Somerville, NJ), and interrupt knots were created along the closure line.

## 3 | Results

### 3.1 | Comparison of baseline characteristics between the barbed suture and interrupt suture groups

Baseline characteristics and clinical factors were compared between the barbed suture ( $n = 27$ ) and interrupt suture ( $n = 13$ ) groups (Table 1). Age, sex, tumor location, suture site, defect size, type of surgery, and reconstruction were not significantly different between the two groups.

### 3.2 | Comparison of outcomes between the barbed suture and interrupt suture groups

Comparison of suture time and complications between the two groups were described at Table 2. Suture time was significantly shorter in the barbed suture group ( $8.9 \pm 8.7$  minutes) than in the interrupt suture group ( $21.2 \pm 12.6$  minutes). Suture time in the oral cavity was  $9.0 \pm 4.1$  minutes in the barbed suture group and  $15.0 \pm 11.6$  minutes in the interrupt suture group. Suture time in the oral cavity with base of tongue defects was  $11.8 \pm 18.4$  minutes in the barbed suture group and  $33.9 \pm 5.9$  minutes in the interrupt suture group. Buccal or retromolar closure time was  $6.2 \pm 1.2$  minutes in the barbed suture group and  $17.5 \pm 7.1$  minutes in the interrupt suture group. Interestingly, the discrepancy of suture time between the two groups was more prominent at the deep part of oral cavity and in the narrow space close to the teeth, such as that encountered at the base of the tongue and retromolar trigone area.

Complication rates were not significantly different between the two groups. More than half of the barbed suture group (51.9%) suffered from a prickling foreign body sensation because of the hard texture, but the patients of the interrupt suture group (23.1%) revealed painless foreign body sensation. There was no significant difference of wound dehiscence and foreign body sensation between the two groups.

## 4 | Discussion

Reconstruction of the oral cavity and oropharynx after transoral cancer ablation is a key step to restore swallowing, speech, and respiration abilities and prevent wound complication.<sup>10</sup> However, oral cavity interrupt

knot tying suturing takes time and effort because it is difficult to visualize and access deep and narrow spaces. In our study, we presented a time sparing method without additional complication in comparison with conventional interrupted knot tying suturing. Furthermore, time saving with barbed knotless continuous suture was effective for narrow and deep spaces, such as retromolar and base of the tongue areas, where surgeons have difficulty manipulating instruments.

Our study demonstrated successful outcomes with the barbed suture by measuring suture time and analysis of complication, which were not reported previously. Suture time was markedly decreased by the barbed suture, while complication was comparable between the two groups. Notably, some patients of the barbed suture group reported prickling sensation during follow up because of the stiff and barbed nature of the material, which was resolved after removal of protruding suture material. Among three patients in the barbed suture group who experienced dehiscence, two suffered partial necrosis of a flap, and one showed dehiscence due to suture site necrosis and inflammation. In the interrupt suture group, wound dehiscence was observed in one patient due to suture site necrosis and inflammation. We assumed that both suturing methods provided similar watertight closure. The barbed sutures have multiple regular anchoring points, which could offer a consistent tension along the suture line and appropriate tension to prevent saliva infiltration.

We experienced convenience and safety of closure of oral/oropharyngeal defects using the barbed knotless continuous suture. Based on this, we applied the barbed suture in almost every subsequent case of oral/oropharyngeal suture, even in hard palate and nasal sinus defects. The barbed suture has been shown to be effective in cases of hard palate and maxillary defects, which were reconstructed with free flaps and had weight-bearing.

This study was performed by a single experienced surgeon and involved patient enrollment over a short time period. The data could be supplemented by further large-scale studies using transoral robotic surgery.

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**Table 1** Baseline Characteristics of the Enrolled Patients ( $N = 40$ )

Clinical factors	Barbed suture group ( $n = 27$ )	Interrupt suture group ( $n = 13$ )	$p$ -value
Age (years, mean $\pm$ SD)	56.3 $\pm$ 14.6	60.3 $\pm$ 15.7	0.376
Sex (M:F, n, %)	19:8 (70.4:29.6)	8:5 (61.5:38.5)	0.722
Primary vs. Salvage (n, %)	24:3 (88.9:11.1)	11:2 (84.6:15.4)	0.702
<b>Tumor location (n, %)</b>			
Tongue / RMT/ FOM / Buccal	20 / 2 / 2 / 3 (74.1 / 7.4 / 7.4 / 11.1)	9 / 0 / 2 / 2 (69.2 / 0 / 15.4 / 15.4)	0.450
<b>Surgery (n, %)</b>			
Partial glossectomy	18 (66.7)	9 (69.2)	0.741
Hemiglossectomy	3 (11.1)	1 (7.7)	
Subtotal glossectomy	1 (3.7)	1 (7.7)	
Buccal resection	3(11.1)	2 (15.4)	
RMT resection	2 (7.4)	0 (0)	
<b>Suture site (n, %)</b>			
Oral cavity (tongue $\pm$ FOM)	18 (66.7)	7 (53.8)	
Oral cavity + BOT	5 (18.5)	4 (30.8)	0.710
Buccal or RMT	4 (14.8)	2 (15.4)	
<b>T stage (n, %) 1:2:3:4</b>	13:9:2:1 (48.1:33.3:7.4:11.1)	6:3:3:1 (46.2:23.1:23.1:7.7)	0.544
<b>Defect size (long, cm, mean <math>\pm</math> SD)</b>	7.5 $\pm$ 2.3	4.9 $\pm$ 1.9	0.391
<b>Defect size (short, cm, mean <math>\pm</math> SD)</b>	6.9 $\pm$ 2.9	5.4 $\pm$ 1.8	0.252
<b>Primary vs. Salvage Reconstruction</b>			
Primary	13 (48.1)	7 (53.8)	0.903
Regional flap	4 (14.8)	2 (15.4)	
Free flap	10 (37.0)	4 (30.8)	

Abbreviations: SD, standard deviation; RMT, retromolar trigone; FOM, floor of mouth; BOT, base of the tongue.

**Table 2.** Comparison of Outcomes Between the barbed suture and interrupt suture group ( $N = 40$ ).

Clinical factors	Barbed suture group ( $n = 27$ )	Interrupt suture group ( $n = 13$ )	$p$ -value
<b>Suture time (min, mean<math>\pm</math>SD)</b>	8.9 $\pm$ 8.7	21.2 $\pm$ 12.6	<b>&lt;0.001</b>
Oral cavity (tongue or FOM)	9.0 $\pm$ 4.1	15.0 $\pm$ 11.6	
Oral cavity + BOT	11.8 $\pm$ 18.4	33.9 $\pm$ 5.9	
Buccal or RMT	6.2 $\pm$ 1.2	17.5 $\pm$ 7.1	

Complications (n, %)			
Dehiscence	3 (11.1)	1 (7.7)	0.608
Foreign body sensation	14 (51.9)	3 (23.1)	0.082

Abbreviations: FOM, floor of mouth, BOT, base of the tongue; RMT, retromolar trigone.

FIGURE LEGEND

**Figure 1** Transoral barbed suture technique using the barbed suture. (A) Suturing was started from the deep portion of the defect, such as base of the tongue. (B) Continuous suturing was performed with regular spaces between the stitches. (C) The barbed suture was cut to leave a length of 5 mm after suturing, and the material was pulled inversely with mild tension to determine whether the barbed suture was fixed well in the tissue. Clinical course of a patient sutured with the barbed suture. (D) Intraoperative image, (E) one month after surgery (F) three months after surgery.

