Barbed Suture versus Interrupted Suture in Posterior Cervical Spine Surgery: Are They Equivalent?

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Abstract:

Introduction: Posterior cervical spine approaches have been associated with increased rates of wound complications compared to anterior approaches. While barbed suture wound closure for lumbar spine surgery has been shown to be safe and efficacious, there is no literature regarding its use in posterior cervical spine surgery. In a cohort of patients undergoing elective posterior cervical spine surgery, we sought to compare postoperative complication rates between barbed and traditional interrupted suture closure.

Methods: A retrospective review of demographics, past medical history, and operative and postoperative variables collected from a prospective registry between July 1, 2016, and June 30, 2020 was undertaken. All patients 18 years old and above undergoing elective posterior cervical fusion were included. The primary outcome of interest was wound complications, including surgical site infection (SSI), dehiscence, or hematoma. In addition, numerical rating scale (NRS) neck pain (NP), NRS arm pain (AP), Neck Disability Index (NDI), and operative time were collected. A variety of statistical tests were used to compare the two suture groups.

Results: Of 117 patients undergoing posterior cervical fusion, 89 (76%) were closed with interrupted suture and 28 (24%) with barbed suture. The interrupted cohort were more likely to have >1 comorbidity ($p<0.001$), diabetes mellitus ($p=0.013$), and coronary artery disease ($p=0.002$). No difference in postoperative wound complications between interrupted/barbed sutures was observed after univariate (OR 1.07, 95% CI: 0.27-4.25, $p=0.927$) and multivariable logistic regression analysis (OR 0.77, 95% CI: 0.15-4.00, $p=0.756$). Univariate logistic regression revealed no differences in achieving minimal clinically important difference (MCID) NRS-NP (OR 0.73, 95% CI: 0.28-1.88, $p=0.508$) or NRS-AP (OR 0.68, 95% CI: 0.25-1.90, $p=0.464$) at 3 months between suture groups. The interrupted suture group was less likely to achieve MCID NDI at 3 months (OR 0.29, 95% CI: 0.11-0.80, $p=0.016$).

Conclusions: Barbed suture closure in posterior cervical spine surgery does not lead to higher rates of postoperative wound complications/SSI compared to traditional interrupted fascial closure.

Keywords:

barbed suture, interrupted suture, wound closure, postoperative complications, patient-reported outcomes

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Introduction

Proper wound closure in spine surgery is crucial, as it contributes directly to minimizing postoperative infection rates and complications[1)]. In particular, posterior cervical spine approaches have been associated with increased rates of surgical site infection (SSI), especially compared to anterior approaches[2)]. Additionally, increased incidence of wound dehiscence and paraspinal muscle diastasis can lead to increased reoperation rates and the need for paraspinal muscle flap closure[3,4)]. Therefore, careful reapproximation of the muscle, fascia, subcutaneous, and dermal layers using meticulous technique, is key to lowering morbidity following posterior cervical spine surgery.

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The development of barbed suture represents an innovative method for wound closure, as the suture is self-anchoring and does not require knot tying or slack management[5]. The use of barbed sutures in operative closure has been shown to be efficacious in several surgical fields, including hand, joint replacement, and abdominal surgery[5-8]. Particularly, barbed suture has been shown in thoracolumbar spinal surgery to have comparable strength with decreased suturing time compared to traditional interrupted suture[9]. Compared to the interrupted technique, barbed sutures have been shown to reduce both suture time and operative time, thus possibly decreasing the risk of perioperative infection[9,10]. However, despite abundant literature on the perioperative and economic benefits of barbed suture, its role in spine surgery remains understudied[11,12].

To date, no studies have examined the wound complication rates with the use of barbed suture in patients undergoing posterior cervical spine surgery. Given the increased rates of infection and wound dehiscence in patients undergoing posterior cervical approaches, understanding the safety profile of barbed suture use is critical to minimize postoperative complications while increasing efficiency. Thus, in a cohort of patients undergoing elective posterior cervical decompression and fusion, our objectives were to (a) compare postoperative wound complication rates between traditional interrupted suture and barbed suture and (b) evaluate the influence of suture type and PROs at 3 months postoperatively.

Materials and Methods

Study design and patient population

Data from an institutional, prospective spine registry were obtained for patients who underwent elective posterior cervical fusion between July 1, 2016, and June 30, 2020. Institutional Review Board approval was obtained from the authors' affiliated institution.

Data collection

Demographics, past medical history, and operative and postoperative clinical variables were collected from electronic medical records and stored in a secure REDCap database[13,14]. Inclusion criteria were adult patients 18 years and older undergoing posterior cervical fusion with complete clinical and operative data. Pediatric patients, patients undergoing anterior cervical approaches, and patients without a documented closure suture type were excluded.

Exposure variable

The primary independent variable of interest was closure suture type in the fascial layer, dichotomized into interrupted suture and barbed suture closure. The standard interrupted technique was done using #1 Vicryl sutures in the fascia in a figure of eight fashion, followed by 2-0 Vicryl sutures in the deep dermal layer and 2-0 nylon sutures for skin. The barbed suture closure technique was done with #1 Stratafix™ (Ethicon®) barbed suture in the facia in a running fashion, followed by 2-0 Vicryl suture in the deep dermal layer and 2-0 nylon sutures for the skin. At our institution, the average cost for Stratafix suture is $23.23 per pack, while the average cost for #1 Vicryl is $9.63. Typically, one pack of Stratafix suture is sufficient in closure, compared to two packs of #1 Vicryl. Therefore, the cost of the two closure methods is comparable. Selection criteria for traditional interrupted and barbed suture closure were based on an institution-wide adoption of barbed suture rather than surgeon preference and consistent within and among surgeons.

Outcome variables

The primary outcome of interest was postoperative wound complications. Since the exposure of interest was based on suture technique and wound healing, which occurs in the early postoperative period, only the immediate postoperative period (0-3 months) was analyzed. Immediate postoperative wound complications included wound dehiscence, hematoma formation, and SSI requiring at minimum a course of antibiotics. In addition, SSI infections occurring within 1 year of surgery were also recorded.

Secondary outcomes of interest included PROs, which were collected preoperatively and at 3-month postoperative follow-up. PROs included 1) numerical rating scale (NRS) neck pain, 2) NRS arm pain (AP), and 3) Neck Disability Index (NDI). In addition to mean Patient-Reported Outcomes (PRO) values, minimal clinically important difference (MCID) was determined, defined as a 30% improvement in PROs from baseline[15]. Higher NRS/NDI numbers correlate to increased symptoms and decreased improvement and outcomes. PROs were prospectively collected over the phone or via email before surgery and at 3 months postoperatively as a part of registry data. Patients with NRS neck/arm values of 0 preoperatively and postoperatively were removed from MCID analysis. Other secondary outcomes of interest included operative time, discharge disposition, return to work, readmission, and reoperation.

Statistical analysis

Descriptive statistics for demographics and preoperative and postoperative variables were recorded. Mean and standard deviation were reported for continuous variables, and frequency was reported for categorical variables. Student's t-tests were used to compare continuous data, while Pearson's chi-squared tests were used to compare categorical variables. Linear regression was performed for continuous variables and binary logistic regression to assess the effect of suture type. Subsequently, multivariate logistic regression and linear regression were performed controlling for age at surgery, gender, race, body mass index (BMI), diabetes mellitus, primary/revision surgery, and preoperative NDI. Statistical significance was set a priori at a p-value <0.05 to determine any potential association between suture type, postoperative wound complications, and PROs. SPSS Version 27.0 (IBM

Table 1. Demographic Characteristics of Patients Who Underwent Posterior Cervical Spine Fusion.

Variables		Interrupted Suture (N=89)	Barbed Suture (N=28)	p-value
Age, *mean*±SD		61.3±12.8	63.4±12.5	0.899
Gender, *n* (%)				0.377
Male		56 (63)	15 (54)	
Female		33 (37)	13 (46)	
Race, *n* (%)				0.850
White		75 (84)	24 (86)	
Non-White		13 (15)	4 (14)	
Unknown		1 (1)	0 (0)	
BMI, *mean*±SD		29.5±5.9	29.2±5.4	0.994
Comorbidities, *n* (%)	0	8 (9)	9 (32)	**<0.001**
	1	49 (55)	19 (68)	
	2+	32 (36)	0 (0)	
Hypertension, *n* (%)		61 (69)	18 (64)	0.675
Diabetes mellitus, *n* (%)		27 (30)	2 (7)	**0.013**
CAD, *n* (%)		25 (28)	0 (0)	**0.002**
COPD, *n* (%)		6 (7)	2 (7)	0.942
CHF, *n* (%)		4 (4)	0 (0)	0.254
Osteoporosis, *n* (%)		4 (4)	0 (0)	0.254
Active smoker, *n* (%)		19 (21)	4 (14)	0.412
Insurance, *n* (%)				0.278
Medicare/Medicaid/TennCare		46 (52)	15 (54)	
Private		29 (33)	10 (36)	
VA/Government/Tricare		14 (16)	2 (7)	
Uninsured/NA		0	1 (4)	
Currently Employed, *n* (%)		29 (33)	8 (29)	0.690
Intend to return to work, *n* (%)		28 (97)	8 (100)	0.594
Preoperative Ambulation, *n* (%)				0.114
Independent		60 (67)	24 (86)	
With assistance		27 (30)	3 (11)	
Wheelchair-bound		2 (2)	1 (4)	
Diagnosis, *n* (%)				**0.029**
Stenosis		31 (35)	18 (78)	
Pseudoarthrosis		29 (33)	4 (17)	
Spondylolisthesis		7 (8)	0 (0)	
Deformity/Scoliosis		6 (7)	0 (0)	
Tumor		5 (6)	1 (4)	
Fracture		3 (3)	0 (0)	
Other		8 (9)	0 (0)	
Revision, *n* (%)		30 (34)	11 (39)	0.590

p-values <0.05 indicate a significant difference

SD represents standard deviation.

BMI, body mass index; CAD, coronary artery disease; COPD, chronic obstructive pulmonary disease; CHF, congestive heart failure

Inc., Chicago, Illinois) was used to perform all statistical analysis.

Results

Demographic characteristics

Of the 117 patients undergoing elective posterior cervical fusion during the study period, 89 (76%) underwent closure with the standard interrupted technique, while 28 (24%) underwent closure using barbed suture (Table 1). The majority of patients were Caucasian (n=99, 85%). Mean age of the cohort was 61.8±12.7 years, and most patients were male (n =71, 61%). A total of 68 (58%) patients presented with at least one comorbidity, with 32 (27%) exhibiting two or more. Most patients underwent a primary surgical intervention (n=76, 65%), with the remaining undergoing revision surgery. Of revision surgeries, the majority were revisions of anterior operations (n=34, 83%), with the remaining posterior approach revisions (n=7, 17%).

Comparing differences between both suture groups, patients closed with barbed suture were less likely to have at least one comorbidity (68% vs. 91%, p<0.001) (Table 1). Of note, patients with barbed sutures were less likely to have diabetes (7% vs. 30%, p=0.013) and coronary artery disease (0% vs. 28%, p=0.002). A statistically significant difference (p=0.029) was observed in preoperative diagnosis among the suture groups, with more stenosis patients closed with barbed suture (78% vs. 35%, respectively) and pseudarthrosis patients closed with interrupted suture (33% vs. 17%, respectively). No statistically significant differences were observed in age, gender, race, BMI, preoperative ambulatory status, and surgery type (primary vs. revision) between the two suture groups.

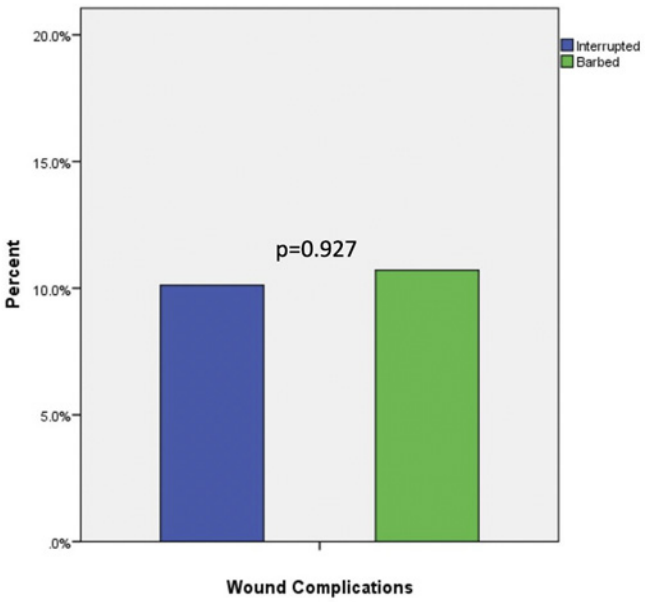

Figure 1. Postoperative wound complication rates between interrupted and barbed suture.

Postoperative wound complications and PROs

After simple univariate comparison, no statistically significant difference was observed in overall operative time between interrupted and barbed suture groups (176±84 min vs. 177±58 min, p=0.972). No difference in immediate postoperative wound complications was observed between the interrupted (n=9, 10%) and barbed (n=3, 11%) suture groups (p=0.927) (Fig. 1). Both groups experienced similar rates of SSI (6% vs. 7%) and dehiscence (6% vs. 4%). One hematoma was noted in the interrupted suture group. No differences were observed between the two groups in readmission rates at 30 days (7% vs. 11%, p=0.491) and 90 days (9% vs. 14%, p=0.420). While no patients in the interrupted suture group underwent reoperation, one patient in the barbed suture group underwent a reoperation for wound dehiscence. Furthermore, no differences were observed between the two groups in discharge disposition or rate of reoperation. Table 2 summarizes the postoperative wound complication data. In addition, no differences were found in 1 year SSI rates (p=0.942).

At the 3-month postoperative follow-up visit, NRS neck pain significantly decreased in both the interrupted suture (5.6±3.0 vs. 3.4±2.8, p<0.001) and barbed suture (5.6±3.1 vs. 4.1±2.7, p<0.001) groups compared to baseline values. Similarly, a significant improvement was found in NRS AP in the interrupted suture (4.2±3.2 vs. 2.2±3.0, p=0.012) and barbed suture groups (4.9±2.9 vs. 2.7±2.9, p<0.001). Furthermore, both interrupted (43.2±16.1 vs. 27.6±18.4, p< 0.001) and barbed suture (42.1±17.1 vs. 35.6±17.9, p= 0.006) groups exhibited a significant decrease in NDI at 3 months postoperatively compared to baseline. The majority of patients with interrupted suture achieved MCID 30% reduction at 3 months in NRS neck (n=35, 51%), NRS arm (n

Table 2. Operative Variables and Postoperative Wound Complications of Patients Who Underwent Posterior Cervical Spine Fusion.

Variables	Interrupted Suture (N=89)	Barbed Suture (N=28)	p-value
Operative Time (minutes)	176±84	177±58	0.972
Postoperative Wound Complications within 3 months, *n* (%)	9 (10)	3 (11)	0.927
SSI	5 (6)	2 (7)	
Dehiscence	5 (6)	1 (4)	
Hematoma	1 (1)	0 (0)	
SSI within 1 Year	6 (7)	2 (7)	0.942
Discharged, *n* (%)			0.634
Home	77 (87)	24 (86)	
In-patient rehab facility	9 (10)	2 (7)	
Skilled nursing facility	3 (3)	2 (7)	
Readmission, *n* (%)			
<30 days	6 (7)	3 (11)	0.491
<90 days	8 (9)	4 (14)	0.420
Reoperation, *n* (%)	0 (0)	1 (4)	0.073
Wound-related (dehiscence/infection)	0 (0)	1 (4)	

SSI: Surgical site infection

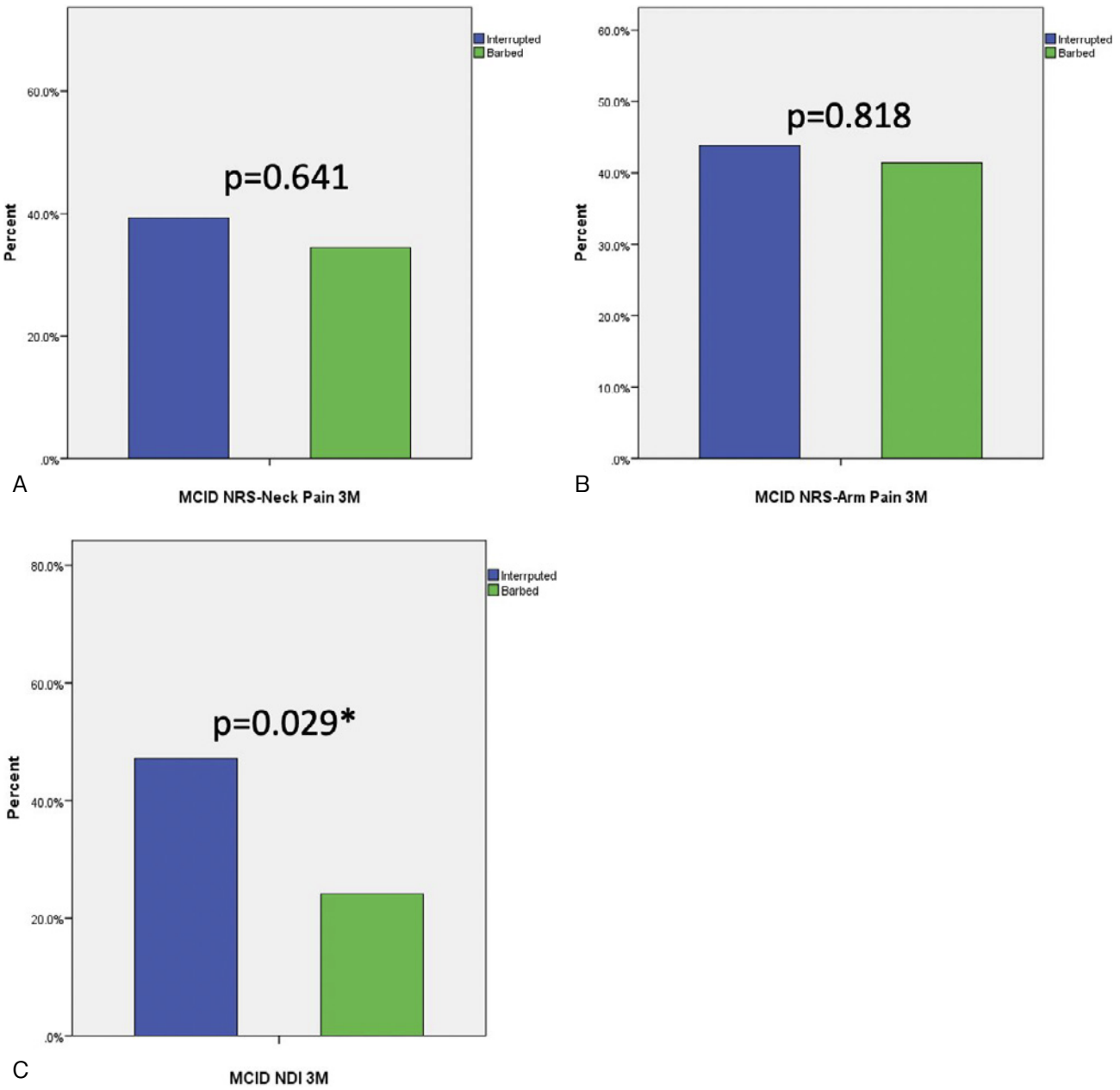

Figure 2. Patient-reported outcomes for interrupted and barbed suture at 3 months. (A) MCID NRS neck pain. (B) MCID NRS AP. (C) MCID NDI.

=39, 66%), and NDI (n=42, 58%), while less than half of patients in the barbed suture group reported MCID 30% reduction for NRS neck (n=10, 44%) and NDI (n=7, 29%). Comparing differences between suture groups, patients closed with barbed sutures were less likely to achieve MCID NDI at 3 months (p=0.029) (Fig. 2). Table 3 presents PRO data.

Regression modeling for postoperative wound complications

Univariate binary logistic regression comparing suture groups revealed no statistically significant difference in postoperative wound complication rate between interrupted and barbed suture (OR 1.07, 95% CI: 0.27-4.25, p=0.927). Furthermore, age (p=0.061), female gender (p=0.164), non-White race (p=0.771), and BMI (p=0.740) were not associated with higher postoperative wound complications. Similarly, those undergoing revision surgery did not experience higher complications than their primary surgery counterparts (p=0.613).

When controlling for age, gender, race, BMI, diabetes, surgery type (primary/revision surgery), and preoperative NDI, multivariable logistic regression analysis again revealed no significant difference in postoperative wound complications between interrupted and barbed suture groups (OR 0.77, 95% CI: 0.15-4.00, p=0.756). Table 4 highlights univariate and multivariable logistic regression analysis for factors related to postoperative wound complications.

Table 3. Patient-reported Outcomes for Patients Undergoing Posterior Cervical Spine Fusion.

PROs	*Interrupted Suture*				*Barbed Suture*			
	Pre-op	3 months	MCID 30% reduction at 3 months, *n* (%)	p-value (pre-op to 3 months)	Pre-op	3 months	MCID 30% reduction at 3 months, *n* (%)	p-value (pre-op to 3 months)
NRS neck	5.6±3.0	3.4±2.8	35 (51)	**<0.001**	5.6±3.1	4.1±2.7	10 (44)	**<0.001**
NRS arm	4.2±3.2	2.2±3.0	39 (66)	**0.012**	4.9±2.9	2.7±2.9	12 (57)	**<0.001**
NDI	43.2±16.1	27.6±18.4	42 (58)	**<0.001**	42.1±17.1	35.6±17.9	7 (29)	**0.006**

p-values <0.05 indicate a significant difference

Mean±S.D. *for continuous variables and n (%) for categorical variables.*

PRO, patient-reported outcomes; MCID, minimal clinically important difference; NRS, numeric rating scale; NDI, Neck Disability Index

Table 4. Logistic Regression for Factors Related to Postoperative Wound Complications.

Variables	Univariate		Multivariable	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Age	1.06 (1.00, 1.12)	0.061	1.09 (1.01–1.18)	**0.027**
Gender				0.083
Male	REF	0.164	REF	
Female	2.37 (0.70, 7.98)		3.64 (0.85, 15.69)	
Race				
White	REF	0.771	REF	0.476
Non-White	1.27 (0.25, 6.42)		2.03 (0.29, 14.28)	
BMI	1.02 (0.92, 1.13)	0.740	1.03 (0.92, 1.16)	0.58
Diabetes mellitus				
No	REF	0.986	REF	0.856
Yes	1.01 (0.26, 4.03)		0.86 (0.17, 4.36)	
Primary/revision surgery				
Primary	REF	0.613	REF	0.258
Revision	1.37 (0.41, 4.62)		2.35 (0.53, 10.35)	
Preoperative NDI	1.00 (0.96, 1.04)	0.994	0.99 (0.94, 1.04)	0.735
Suture type				
Interrupted	REF	0.927	REF	0.756
Barbed	1.07 (0.27, 4.25)		0.77 (0.15, 4.00)	

REF, reference; BMI, body mass index; NDI, Neck Disability Index

Regression modeling for PROs

Univariate logistic regression for MCID NRS revealed no difference between suture groups in patients achieving MCID NRS neck (OR 0.73, 95% CI: 0.28-1.88, p=0.508) or MCID NRS AP (OR 0.68, 95% CI: 0.25-1.90, p=0.464). However, compared to interrupted suture, univariate analysis showed that the barbed suture was less likely to achieve MCID NDI at 3 months (OR 0.29, 95% CI: 0.11-0.80, p= 0.016). In addition, non-White race [OR 0.21, 95% CI: 0.05-0.82, p=0.024)] and revision surgery (OR 0.40, 95% CI: 0.17-0.96, p=0.040) were independently associated with a lower likelihood of achieving MCID NDI.

Multivariable logistic regression for MCID comparing suture groups showed no difference between barbed suture and interrupted suture in predicting MCID NRS neck (OR 0.81, 95% CI: 0.29-2.26, p=0.682) and NRS AP (OR 0.57, 95% CI: 0.17-1.94, p=0.365). However, a significant decrease in the proportion of barbed suture patients achieving MCID NDI (OR 0.32, 95% CI: 0.11-0.95, p=0.016) was observed when adjusting for age, gender, race, BMI, diabetes, surgery type, and preoperative NDI. Furthermore, non-White race (OR 0.16, 95% CI: 0.04-0.76, p=0.021) and revision surgery (OR 0.33, 95% CI: 0.12-0.97, p=0.043) remained significant when adjusting for confounding variables in multivariable analysis. Table 5 summarizes this data.

Discussion

The present study sought to compare postoperative wound complication rates and PROs based on interrupted suture versus barbed suture in patients undergoing elective posterior cervical spinal fusion. Our study found similar immediate postoperative wound complication rates in the barbed suture group compared to the interrupted suture group. Both interrupted and barbed suture closure were associated with

Table 5. Logistic Regression for Factors Related to MCID NRS/NDI at 3 Months.

Variables	MCID NRS Neck				MCID NRS Arm				MCID NDI			
	Univariate		Multivariable		Univariate		Multivariable		Univariate		Multivariate	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Age	1.02 (0.98, 1.05)	0.431	1.00 (0.96, 1.04)	0.883	1.00 (0.96, 1.04)	0.843	0.99 (0.95, 1.04)	0.809	1.00 (0.97, 1.03)	0.952	0.99 (0.95, 1.03)	0.662
Gender												
Male	REF	0.245	REF	0.475	REF	0.409	REF	0.227	REF	0.817	REF	0.843
Female	1.64 (0.71, 3.76)		0.72 (0.29, 1.78)		1.47 (0.59, 3.70)		1.99 (0.65, 6.09)		1.10 (0.49, 2.47)		1.11 (0.41, 2.95)	
Race												
White	REF	0.117	REF	0.115	REF	0.833	REF	0.522	REF	**0.024**	REF	**0.021**
Non-White	0.37 (0.11, 1.28)		0.33 (0.08, 1.31)		0.88 (0.26, 2.99)		0.62 (0.14, 2.72)		0.21 (0.05, 0.82)		0.16 (0.04, 0.76)	
BMI	1.05 (0.97, 1.12)	0.234	1.07 (0.98–1.16)	0.118	1.13 (1.02, 1.24)	**0.015**	1.17 (1.04, 1.31)	**0.010**	1.01 (0.94, 1.08)	0.879	1.02 (0.94, 1.12)	0.589
Diabetes mellitus												
No	REF	0.596	REF	0.949	REF	0.746	REF	0.377	REF	0.090	REF	0.354
Yes	1.28 (0.51, 3.19)		1.04 (0.36, 3.01)		1.19 (0.42, 3.40)		0.52 (0.12, 2.22)		2.24 (0.88, 5.71)		1.71 (0.55, 5.36)	
Primary/revision surgery												
Primary	REF	0.424	REF	0.495	REF	0.674	REF	0.215	REF	**0.040**	REF	**0.043**
Revision	0.70 (0.30, 1.67)		0.70 (0.26, 1.93)		1.23 (0.47, 3.17)		2.11 (0.65, 6.82)		0.40 (0.17, 0.96)		0.33 (0.12, 0.97)	
Preoperative NDI	0.99 (0.96, 1.02)	0.410	1.00 (0.97, 1.03)	0.770	0.98 (0.95, 1.01)	0.175	0.96 (0.92, 1.00)	**0.032**	1.01 (0.98, 1.03)	0.623	1.01 (0.98, 1.05)	0.403
Suture type												
Interrupted	REF	0.508	REF	0.682	REF	0.464	REF	0.365	REF	**0.016**	REF	**0.041**
Barbed	0.73 (0.28, 1.88)		0.81 (0.29, 2.26)		0.68 (0.25, 1.90)		0.57 (0.17, 1.94)		0.29 (0.11, 0.80)		0.32 (0.11, 0.95)	

p-values <0.05 indicate a significant difference

MCID, minimal clinically important difference; NRS, numeric rating scale; NDI, Neck Disability Index; BMI, body mass index

improvements in PROs at 3-month follow-up. However, at 3-month follow-up, interrupted suture closure was independently associated with a greater improvement in NDI, and more patients closed with interrupted suture compared to barbed suture achieved MCID NDI, which may be due to faster wound healing or less muscle diastasis in this group.

Given that posterior cervical spine approaches have nearly triple the risk of complications and need for reoperation than anterior approaches, an optimal technique in achieving successful closure is critical for patients undergoing posterior approaches[2,16,17]. Many of these complications, including SSI, wound dehiscence, and hematoma formation, are potentially related to wound closure technique. Therefore, understanding potential differences in complication rates and outcomes between closure techniques can potentially reduce postoperative complications and improve patient outcomes[18]. No significant difference was found in postoperative SSI, wound dehiscence, and hematoma formation between interrupted and barbed suture closure in posterior cervical spine fusion. The findings of this present study are similar to studies examining the use of barbed suture in other operative settings. Other studies examining the efficacy of barbed suture in spine surgery by Mansour et al. and Johnston et al. showed no significant increase in postoperative complications with the use of barbed suture compared to conventional suture in scoliosis and elective laminectomy/fusion surgery, respectively[11,12]. In one study, the use of barbed suture has been associated with decreased wound dehiscence and hematoma rates in patients undergoing pedicle screw fixation for thoracolumbar fractures in the acute traumatic setting when compared to traditional suture methods[9]. In surgical settings outside of spine, barbed suture has also been shown to decrease complication rates in total knee arthroplasty patients and in a number of general surgical and gynecologic settings[7,8,19,20]. Given the findings of our study, we found equivalent complication profiles using interrupted suture versus barbed suture with regard to postoperative wound complications.

This study is the first to compare PROs between suture types in the posterior cervical spinal surgery setting, demonstrating more favorable short-term improvement in neck pain in patients closed with interrupted suture. While extensive inquiry into the time and cost savings of barbed suture use has been performed, with barbed suture shown to reduce suturing time, operative time, and costs of operation, few studies have compared PROs between various closure techniques[11,12,21,22]. A meta-analysis of barbed sutures in total joint arthroplasty showed no significant differences in Knee Society Score or range of motion at 6 weeks and 3 months postoperatively[10]. A prospective cohort study conducted by Haga et al., which examined the effects of barbed suture during robot-assisted radical prostatectomy, demonstrated more severe tissue damage determined by MRI in barbed suture and tracked PRO such as International Prostate Symptom Score and quality of life (QOL) at several postoperative timepoints[23]. This study showed a transient aggravation of QOL and continence function in barbed suture. Our study demonstrated a significant improvement in NRS and NDI in patients closed with interrupted suture compared to barbed suture at 3-month follow-up. Despite equivalent complication profiles, several potential reasons exist for improved 3-month NDI in barbed suture patients. It is possible that interrupted sutures approximate the fascia and muscle better and/or reduce tension on the fascial closure to a greater extent, resulting in faster or more anatomic muscle healing and therefore reducing postoperative neck pain. It is known that muscle diastasis after posterior cervical surgery can result in inferior outcomes, and it is possible that the barbed suture group had less anatomic muscle/fascia healing, which could have resulted in this outcome. Alternatively, improved 3-month NDI in the interrupted suture group may simply be an artifact of a small sample size. Furthermore, our study offers a template for probing differences in PROs following various closure techniques in spine surgery given the importance of the paraspinal muscle function in normal spinal biomechanics. Future investigation with a larger cohort is indicated to determine whether the findings of our study can be replicated.

Although our study presents evidence supporting the use of barbed sutures in posterior cervical spine surgery, it is not without limitation. First, classification of suture type was largely reliant on documentation in the operative notes. If no clear evidence of suture type was recorded, the patient was excluded from the study, subsequently limiting sample size. In addition, the single-institution nature of our study limited sample size. Furthermore, while the reliability and construct validity of NRS and NDI have been studied in various cervical etiologies, they remain subjective measures susceptible to reporting differences between various patients[24-26]. Despite these limitations, the present study is the first to report the potential association of suture type and 3-month PROs and provides a brief overview of the benefits and drawbacks of barbed suture use in posterior cervical spine surgery population.

Conclusion

The use of barbed sutures, compared to interrupted sutures, was associated with similar postoperative wound complication rates, including SSI wound, dehiscence, and hematoma development. However, while both groups experienced improvement in PROs at 3-month follow-up, more patients closed with interrupted sutures achieved MCID NDI. The findings of this study should be taken into consideration by surgeons in selecting suture type in closing posterior cervical fusion patients.

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