

Which Stitch? Replacing Anecdote with Evidence in Minor Hand Surgery

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Summary: There is currently no consensus on the optimal suture type for palmar skin closure following open carpal tunnel release and trigger finger release. We performed a retrospective analysis of patients in the Palo Alto Veterans Affairs (PAVA) Health Care System who underwent these procedures over a 2-year period to compare 30-day wound outcomes following closure with polyglactone 25 (Monocryl), nylon, and chromic gut suture. Out of 312 PAVA cases (133 carpal tunnel release, 179 trigger finger release), incisions closed with Monocryl were significantly less likely to develop dehiscence (Monocryl 2.1%, nylon 10.5%, chromic 10.3%; $P = 0.006$) and infection (Monocryl 1.6%, nylon 7.4%, chromic 13.8%; $P = 0.003$), or lead to additional wound-related encounters (Monocryl 8.0%, nylon 16.8%, chromic 24.1%; $P = 0.012$). On multivariable logistic regression, suture type and diabetes were independent predictors of 30-day wound complications and extra encounters. At PAVA, compared with Monocryl, closures with nylon and chromic were significantly more likely to dehisce and/or become infected [nylon: odds ratio (OR), 5.0; 95% CI, 1.9–13.3 and chromic: OR, 9.3; 95% CI, 2.7–32.4; $P = 0.002$], and to be associated with an additional encounter (nylon: OR, 2.4; 95% CI, 1.1–5.3 and chromic: OR, 4.5; 95% CI, 1.6–12.9; $P = 0.007$). This has led to using Monocryl as the standard closure for these cases at PAVA. (*Plast Reconstr Surg Glob Open* 2019;7:e2189; doi:10.1097/GOX.0000000000002189; Published online 1 April 2019.)

INTRODUCTION

Open carpal tunnel release (CTR) and trigger finger release (TFR) are common operations in hand surgery. In the United States, more than 500,000 CTRs are performed annually¹; data on rates of TFR are limited, although estimates suggest up to 31,000 annual cases in the Medicare population alone.² Although the technical steps of each operation are fairly routine, there is no standard of care concerning suture selection for closure of the palmar skin incision.

At our institution, surgeons performed these procedures similarly but had different skin closure preferences. Three different sutures were used for skin closure: polyglactone 25 (Monocryl), nylon (Ethilon), or chromic gut (all Ethicon, Inc.; Somerville, N.J.). Nylon is nonabsorbable. Absorbable Monocryl sutures were buried beneath

the skin. Absorbable chromic was left external. Theoretical advantages of nonabsorbable suture include less reactivity resulting in a more aesthetic scar and greater strength; disadvantages include a propensity to unravel due to high memory and to cut through tissue (“cheese-wire”) under tension.^{3,4} Absorbable sutures have the benefit of not requiring suture removal.³

The purpose of this Palo Alto Veterans Affairs (PAVA) quality improvement study was to determine the optimal suture type for skin closure following CTR and TFR at our institution. We hypothesized that nylon sutures would have the lowest rate of dehiscence.

METHODS

This retrospective chart analysis assessed consecutive patients in the PAVA Health Care System (Palo Alto, Calif.) who underwent CTR and/or TFR from August 2016 to August 2018. Surgeons, residents, and fellows were randomly assigned to cases based on a preset operative schedule. Sutures choice was attending sensitive; however, the majority of sutures were placed by residents and fellows who were equally versed in all techniques. Operations were performed through palmar incisions. Wounds were closed

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Table 1. Demographic and Clinical Characteristics by Suture Cohort

Characteristic (n or mean, % or SD)	Overall (n = 312)	Monocryl (n = 188)	Nylon (n = 95)	Chromic (n = 29)	P
Age, mean (SD)	65.7 (0.8)	64.9 (0.7)	66.1 (1.1)	69.8 (1.8)	0.050
Gender, n (%)					0.560
Male	292 (93.6)	177 (94.1)	87 (91.6)	28 (96.6)	
Female	20 (6.4)	11 (5.9)	8 (8.4)	1 (3.4)	
Diabetic, n (%)	91 (29.1)	53 (28.2)	28 (29.5)	10 (34.5)	0.780
Procedure, n (%)					0.180
Carpal tunnel release	133 (42.6)	78 (41.5)	38 (40.0)	17 (58.6)	
Trigger finger release	179 (57.4)	110 (58.5)	57 (60.0)	12 (41.4)	

with one of the following techniques: interrupted deep dermal 4-0 Monocryl with Dermabond (Ethicon, Inc.; Somerville, NJ) skin adhesive or mattress sutures with 4-0 nylon or 4-0 chromic. Patients who underwent concurrent additional upper extremity procedures were excluded. The standard postprocedure protocol was a soft dressing for 4 days and patients were instructed to avoid heavy lifting for 2 weeks. A bulkier dressing or splint was applied if the patient required hands for transfers or ambulation. Patients followed up at 2 weeks, at which time the wound was checked and any nylon sutures were removed.

Demographics of patients were recorded. Using chart review, 30-day outcomes including wound complications (dehiscence and/or infection) and extra encounters (emergency department, clinic, and/or telephone) for pain, swelling, or other wound concerns were identified. “Dehiscence” was taken from the progress note texts and represented any wound separation noted by the provider. “Infection” included any episode of concern for infection from suture abscess to cellulitis. All outcomes were compared with suture type using chi-squared analysis and multivariable logistic regression. All analyses were performed using Stata/SE Version 15.0 (StataCorp LLC, College Station, Tex.).

RESULTS

A total of 312 cases met inclusion criteria, with 133 CTR (42.6%) and 179 TFR (57.4%) operations (Table 1). Average age was 65.7±0.8 years, and patients were predominantly male (93.6%) with 29.1% prevalence of diabetes. There was no significant difference in demographic or clinical characteristics among suture type cohorts.

Based on a comparison of 30-day outcomes by suture type (Table 2), incisions closed with Monocryl were significantly less likely to develop dehiscence (Monocryl 2.1%, nylon 10.5%, chromic 10.3%; $P = 0.006$) or infection (Monocryl 1.6%, nylon 7.4%, chromic 13.8%; $P = 0.003$), and less likely to prompt antibiotic use in the postoperative period (Monocryl 1.1%, nylon 5.3%, chromic 10.3%; $P = 0.012$). There was no significant difference in the number of cases that required additional procedures ($P = 0.515$). Incisions closed with Monocryl were also associated with fewer additional encounters, including emergency department, clinic, and phone calls (Monocryl 8.0%, nylon 16.8%, chromic 24.1%; $P = 0.012$).

Suture type and diabetes were the only independent predictors of 30-day wound complications and extra wound-related encounters (Table 3). Compared to closures with Monocryl, closures with nylon and chromic were significantly more likely to dehiscence and/or become infected [nylon: odds ratio (OR), 5.0; 95% CI, 1.9–13.3 and chromic: OR, 9.3; 95% CI, 2.7–32.4; $P = 0.002$], and to be associated with an additional encounter (nylon: OR, 2.4; 95% CI, 1.1–5.3 and chromic: OR, 4.5; 95% CI, 1.6–12.9; $P = 0.007$).

DISCUSSION

Suture selection for skin closure is often based upon surgeon preference, with little evidence to support the choice of suture material.⁵ Classic teaching prescribes the use of nonabsorbable suture for wound closure, largely due to greater tensile strength and an assumed superior ability to withstand motion of the hand in the postoperative period. However, this belief is not substantiated in the

Table 2. Thirty-day Outcomes by Suture Type

Outcome, n (%)	Overall (n = 312)	Monocryl (n = 188)	Nylon (n = 95)	Chromic (n = 29)	P
Any wound problem*	49 (15.7)	17 (9.0)	24 (25.3)	8 (27.6)	<0.001
Any wound complication†	27 (8.7)	7 (3.7)	14 (14.7)	6 (20.7)	<0.001
Dehiscence	17 (5.5)	4 (2.1)	10 (10.5)	3 (10.3)	0.006
Infection	14 (4.5)	3 (1.6)	7 (7.4)	4 (13.8)	0.003
Antibiotics	10 (3.2)	2 (1.1)	5 (5.3)	3 (10.3)	0.012
Procedure	2 (0.6)	2 (1.1)	0 (0)	0 (0)	0.515
Any extra encounter‡	38 (12.2)	15 (8.0)	16 (16.8)	7 (24.1)	0.012
ED	12 (3.9)	4 (2.1)	6 (6.3)	2 (6.9)	0.150
Clinic or phone	31 (9.9)	13 (6.9)	12 (12.6)	6 (20.7)	0.040

*Wound complication and/or any extra visit.

†Dehiscence and/or infection.

‡ED and/or clinic, phone, etc.

ED, emergency department.

Table 3. Multivariable Analysis of 30-day Outcomes Compared with Monocryl

Outcome, odds ratio, (95% CI)	Nylon	Chromic	Diabetic	Model <i>P</i>
Any wound problem	3.7 (1.8–7.5)	4.7 (1.7–13.0)	2.7 (1.4–5.2)	<0.001
Any wound complication	5.0 (1.9–13.3)	9.3 (2.7–32.4)	NS	0.002
Dehiscence	6.06 (1.8–20.5)	6.9 (1.4–35.2)	NS	0.020
Infection	5.1 (1.2–20.7)	13.6 (2.7–69.0)	NS	0.030
Antibiotics	NS	13.4 (2.0–90.5)	NS	0.090
Procedure	—	—	—	—
Any extra encounter	2.4 (1.1–5.3)	4.5 (1.6–12.9)	2.6 (1.2–5.3)	0.007
ED	NS	NS	NS	0.520
Clinic, phone, etc.	NS	4.3 (1.4–12.9)	NS	0.110

All other factors (age, gender, and procedure) had *P*value ≥ 0.05 .

ED, emergency department; NS, not significant.

literature; a recent Cochrane meta-analysis of 5 randomized controlled trials comparing absorbable versus nonabsorbable suture following CTR failed to detect any clear difference in outcome measures of pain, wound inflammation, hand function, or scar satisfaction.³

Based on our nonrandomized series, closure with 4-0 buried Monocryl with Dermabond was in the best interest of our patients and providers, compared to closure with 4-0 external nylon or chromic. At PAVA, closure with Monocryl was less likely to dehisce, become infected, or prompt additional clinical encounters for wound-related concerns. An additional benefit is that the use of Monocryl does not require postoperative suture removal, saving patients time and discomfort, and reducing providers' clinical workload and resource utilization.³ In terms of cost, there is a relatively trivial cost difference amongst the three suture types, but the addition of Dermabond increases the price per closure for the Monocryl cohort. (Cost estimates are based on publicly-available prices on commercial websites. Relative pricing per packet, from most to least expensive, is as follows: chromic, Monocryl, and nylon. Use of Dermabond approximately triples the price of a Monocryl closure alone.) However, compared with the cost of additional visits, this still represents significant savings.

Future prospective randomized studies to generalize these findings and quantify the costs are needed. Comparative evaluation of long-term scarring with different suture types should also be considered. Suture allocation was not a major source of bias in our study due to the un-systematic participation of residents and fellows who close the incisions. Last, it is unknown whether Monocryl closure without Dermabond would yield comparable results, which could be considered for future investigation.

In conclusion, along the spectrum of innovative ideas, choosing Monocryl for the closure of open CTR and TFR incisions at PAVA represented a simple change that

achieves the “Triple Aim” of improving the patient experience, improving health, and reducing healthcare costs.⁶ A lesson to all of healthcare, this quality improvement innovation was not borne out of complexity, but rather from critical evaluation and a desire to achieve more with less.

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