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Complications - Infection

Barbed Suture Is Associated With Increased Risk of Wound Infection After Unicompartmental Knee Arthroplasty

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ABSTRACT

Background: Literature addressing the risks of barbed suture in arthroplasty remains limited. No study to our knowledge has compared rates of wound infection between barbed and conventional suture after unicompartmental knee arthroplasty (UKA). We hypothesized that barbed suture would be associated with an increased risk of wound infection in patients undergoing UKA.

Methods: Electronic records were retrieved for 1040 UKA procedures. Odds ratios with postoperative wound infection as the outcome and barbed suture as the exposure were calculated. Binary logistic regression corrected for age, gender, body mass index, operative time, and risk factors (smoking, diabetes, renal insufficiency, and immunosuppression). Barbed suture consisted of Quill #2 polydioxanone (or #0 Vicryl) for deep closure and Quill 2-0 Monoderm for subcuticular closure. Conventional suture consisted of #0 Vicryl for deep closure and subcuticular 2-0 Monocryl or staples for skin closure.

Results: A total of 839 procedures were included. Barbed suture was used in 333 surgeries, and conventional suture was used in 506. Eight cases of postoperative wound infection were identified. All infections occurred in the barbed suture cohort. Regression analysis revealed an association between subcuticular barbed suture and postoperative wound infection (odds ratio = 22.818, confidence interval = 2.69-2923.91; $P = .0074$).

Conclusions: The findings indicate that the use of barbed suture in subcuticular layer closure is associated with an increased risk of wound infection. This may be exacerbated by early intensive mobilization, commonly undertaken after UKA to permit rapid functional return. We recommend against the use of barbed suture for subcuticular layer closure in UKA.

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Barbed suture has been used in plastic, general, and urogynecologic procedures with favorable results [1-5]. However, the suitability and safety profile of barbed suture for arthroplasty remain unclear. Existing studies are limited in number and often nonuniform with regard to the procedures performed [2,6-14]. Reported complications vary by series, resulting in a lack of overall consensus with respect to the risks of this technology in joint arthroplasty [2,6-14].

The literature is particularly sparse concerning the use of barbed suture in unicompartmental knee arthroplasty (UKA). Only 1 study has included patients undergoing UKA in combination with patients undergoing total knee arthroplasty (TKA) [2]. The authors reported higher wound complication rates when closing with V-Loc barbed suture, prompting discontinuation of its use [2]. A need, therefore, exists for (1) studies evaluating the risks of barbed suture in UKA exclusively and (2) a consolidated review of prior studies addressing barbed suture in arthroplasty.

To our knowledge, no study to date has compared complication rates between barbed and conventional suture in a standardized population of patients undergoing UKA. The aim of this study was to determine if barbed suture confers a greater risk of postoperative wound infection after UKA. We hypothesized that barbed suture would be associated with an increased risk of wound infection in a large standardized population of patients undergoing UKA.

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Materials and Methods

Enrollment

After institutional review board approval, records were retrieved for 1040 robot-assisted UKA procedures between June 2007 and August 2015. Patients were required to fulfill the criteria of (1) isolated unicompartmental osteoarthritis, (2) passively correctable angular deformity, and (3) a fixed-flexion deformity <10° to be considered eligible for UKA. Only medial UKA procedures were included to ensure uniformity of the operative exposure and technique. Revision procedures were excluded. The minimum follow-up period was 16 weeks. A total of 839 procedures met final inclusion criteria.

Data Retrieval

Demographic information included (1) age, (2) gender, and (3) body mass index (BMI). Technical specifications included (1) side of operation, (2) suture used for wound closure, and (3) operative time. Documented risk factors for infection were (1) smoker status, (2) diabetes mellitus, (3) renal insufficiency, and (4) immunosuppressant medications or immunocompromised state [12,13,15,16]. Data were retrieved from the institutional electronic medical record system (Allscripts Sunrise 6.1; Allscripts, Chicago, IL).

Outcomes of interest were superficial (relative to the arthrotomy) or deep infection (confirmed intraoperatively by periprosthetic purulence, sinus tracts in communication with the prosthesis and/or positive joint cultures) [17]. Cases were identified from the surgical log of the senior author (A.D.P.). Supplementary information for cases included (1) presenting symptoms (2) time from index procedure to symptom manifestation, (3) intraoperative diagnosis, (4) microbiology cultures, and (5) operative intervention.

Surgical Procedure

All UKA procedures were performed by a single surgeon (A.D.P.), using a robot-assisted platform (MAKO Tactile Guidance System; MAKO Surgical Corporation, Fort Lauderdale, FL). A medial fixed-bearing implant was placed after tibial and femoral resurfacing. Patients received either a RESTORIS MCK Onlay or RESTORIS MCK Medial Unicondylar Inlay tibial component (MAKO Surgical Corporation). All surgeries were performed in an inpatient setting at the same hospital, with a variable length of stay based on pain and functional ambulation status. Each patient received a single intravenous (IV) dose of preoperative antibiotics and 2 IV doses postoperatively.

Wound Closure

Patients were retrospectively assigned to 1 of the 2 cohorts, in which barbed (cohort 1) or conventional (cohort 2) suture was used. Cohorts were subdivided on the basis of variations in closure (Table 1).

Table 1
Closure Technique Cohorts.

Cohort	Closure Layer		
	Arthrotomy	Subcutaneous	Skin
1A (n = 89)	Quill #2 PDO	Vicryl 2-0	Quill 2-0 Monoderm
1B (n = 244)	Vicryl #0	Vicryl 2-0	Quill 2-0 Monoderm
2A (n = 243)	Vicryl #0	Vicryl 2-0	2-0 Monocryl
2B (n = 263)	Vicryl #0	Vicryl 2-0	Skin staples

Table 2
Patient Demographics and Risk Factors.

Cohort	Traditional (n = 506)	Barbed (n = 333)	*P* Value
Age	63.71 ± 10.37	64.31 ± 9.71	.395
Gender (F, M)	239, 267	155, 178	.845
BMI	29.68 ± 5.36	29.38 ± 5.30	.440
Operative time (min)	100	91	<.001
Smoker, active (%)	6.5	2.7	.014
Smoker, former (%)	18.9	33.6	<.001
Diabetes mellitus (%)	7.1	6.9	.915
Renal insufficiency (%)[a]	1.0	0.6	.566
Immunosuppressed or immunocompromised (%)	6.7	7.2	.775
Wound complications (%)[a]	0.0	2.4	<.001

F, female; M, male; BMI, body mass index.
[a] Denotes use of Fisher's exact test due to group size ≤5.

Deep closure in cohort 1A was performed with Quill #2 PDO (Surgical Specialties Corporation, Wyomissing, PA). The subcutaneous layer was closed with interrupted 2-0 Vicryl (Ethicon Inc, Somerville, NJ). Subcuticular closure was performed with Quill 2-0 Monoderm (Surgical Specialties Corporation). Dermabond (Ethicon US, Somerville, NJ) was then applied to the incision. Closure of the arthrotomy and skin with Quill was performed in a running bidirectional fashion away from the incision midpoint. Stitches were doubled back and cut flush with the layer of closure.

Conventional closure in cohort 2A began with interrupted Vicryl #0 (Ethicon Inc) in the deep layer. The subcutaneous layer was closed with interrupted 2-0 Vicryl. Running subcuticular closure was performed with 2-0 Monocryl (Ethicon Inc). Dermabond was applied to the incision site.

In cohort 1B, interrupted Vicryl #0 was used for arthrotomy closure. Closure of the subcutaneous and subcuticular layers proceeded in a manner identical to that of cohort 1A. In cohort 2B, skin closure was performed with staples. Dermabond was not applied to the incision site. Closure of the arthrotomy and subcutaneous layers proceeded in a manner identical to that of cohort 2A.

A nonadherent TELFA island dressing (Medline Industries, Mundelein, IL) nested inside a Tegaderm film (3M Company, St. Paul, MN) was used to cover small incisions overlying the femur and tibia. The primary incision was dressed with Medipore soft cloth surgical tape (3M Company). Dressings were removed on postoperative day 2.

Statistical Analysis

Demographic, technical, and risk variables were compared between groups (cohort 1 vs cohort 2) to detect confounding effects. Means with standard deviation were reported for all continuous variables and compared using independent 2-tailed *t* tests. Categorical variables were reported as frequencies per population and compared by chi-square analysis. Fisher's exact test was used when groups contained 5 or fewer subjects.

Binary logistic regression with Firth's penalized likelihood approach was used to generate odds ratios (ORs) with postoperative wound infection as the outcome of interest. Regression corrected for (1) age, (2) gender, (3) BMI, (4) smoker status, (5) diabetes mellitus, (6) renal insufficiency, (7) immune deficiency, and (8) operative time. ORs were reported with 95% confidence intervals (CIs). Subgroup analysis was performed for variables found to be significant using Fisher's exact test. All tests were conducted at a significance threshold of $P < .05$ using SPSS, version 21 (SPSS Inc, IBM Corporation, Armonk, NY).

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