# Dermabond Efficacy in Total Joint Arthroplasty Wounds

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## Abstract

The goals of wound closure are a low infection rate and timely healing. Total joint arthroplasty (TJA) requires mobile recovery, and, therefore, a high-tension wound care environment.

We conducted a study to compare the efficacy of high-viscosity Dermabond (Ethicon, Somerville, New Jersey) and the efficacy of surgical staples in healing high-tension, mobile surgical sites of TJA. Of 236 total knee arthroplasties and 223 total hip arthroplasties (459 surgeries total), 250 were performed with Dermabond and 209 with staples.

According to $\chi^2$ analysis, case and control infection rates were equivalent. Signs of acute inflammation (redness, drainage, dehiscence) also were statistically equivalent. Absence of staples accounted for a significant decrease in tape blisters and skin abscesses. Dermabond is superior to staples in high-tesion wound care.


Successful wound management can be characterized by prevention of dehiscence and infection, ease of management, and patient satisfaction.[1] Orthopedic hip and knee wounds require additional care for drainage control and dressing management but must achieve similar outcomes. Although hematoma resulting from medullary bone has been found to reduce healing, the low-pressure drains used to alleviate this problem have not reduced the infection rate.[2,3] Arthroplasty wounds often require frequent dressing changes, which can induce maceration and thereby interfere with wound healing.[4] Without proper and timely closure of the surgical wound, recovery is prolonged, and the likelihood of deep infection increases.[5]


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Traditional surgical staple methods require maintaining a relatively arid wound environment during healing, but patients have difficulty with this maintenance, which can lead to problems with wound management and higher patient dissatisfaction. Furthermore, staples must be removed within 2 weeks. A more effective method of wound care is needed in high-tension orthopedic cases.

> "Patients are more satisfied with Dermabond wound care (no applied dressings, ease of showering)."

High-viscosity Dermabond (Ethicon, Somerville, New Jersey) has been shown to be an effective alternative to conventional sutures or staples in closing long, low-tension surgical incisions and preventing infection.[6] In some cases, cosmetic outcomes have been better with Dermabond than with sutures.[7] Patients are more satisfied with Dermabond wound care (no applied dressings, ease of showering), and reaction to the product has been positive.[8] In addition, financial analysis has shown tissue adhesive to be more cost-effective than sutures in some applications.[9] Yet, efficacy studies have been limited to surgical incisions in low-tension dermal areas.

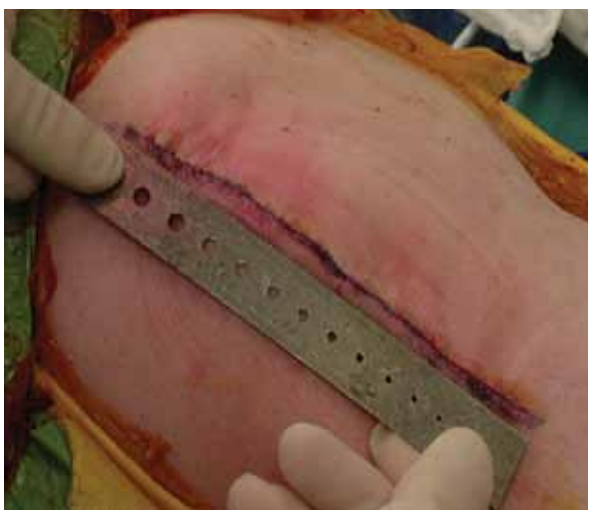

**Figure.** Hip wound after deep and superficial suture closure. Dermabond has been applied to skin. No dressings are required.

**Table. Statistical Analysis[a]**

| | Control | | Case | | *P*[b] | | |
|---|---|---|---|---|---|---|---|
| | Knee | Hip | Knee | Hip | Knee | Hip | Total |
| **Patients** | | | | | | | |
| Female | 58 | 76 | 89 | 64 | .98 | .38 | .52 |
| Male | 35 | 40 | 54 | 43 | — | — | — |
| Mean age (y) | 66 | 63 | 67 | 62 | .48 | .37 | .86 |
| **Infection**[c] | | | | | | | |
| Deep | 0 | 0 | 0 | 0 | — | — | — |
| Superficial | 4 | 1 | 4 | 4 | .53 | .22 | .60 |
| **Inflammation** | | | | | | | |
| Dehiscence | 0 | 2 | 1 | 2 | .42 | .33 | .80 |
| Abnormal redness | 9 | 1 | 14 | 4 | .98 | .22 | .28 |
| Drainage | 0 | 2 | 4 | 1 | .10 | .20 | .36 |
| Tape blister | 0 | 6 | 0 | 0 | — | .00 | .01 |
| Stitch reaction | 2 | 2 | 0 | 0 | .08 | .05 | .03 |
| **Closure Time (min)**[d] | 31.4 | NA | 38.5 | NA | .00 | NA | NA |

Abbreviation: NA, not applicable.

[a]All numbers are n, except where noted otherwise.
[b]Determined from $\chi^2$ test for independence. Knee and hip *P*s reflect their respective surgeries. Total *P* reflects 2 groups defined as all cases and all controls.
[c]Deep infections were defined as requiring débridement, superficial infections as requiring antibiotics.
[d]Total time needed to close all layers of tissue with control or case method. Not recorded for hip cases.

In the study reported here, we compared the efficacy of Dermabond and the efficacy of surgical staples in healing high-tension, mobile surgical sites of the efficacy of total joint arthroplasty (TJA).

## Methods

Dr. Swank performed an unselected consecutive series of 236 primary total knee arthroplasties (TKAs) since 2003 and 223 primary total hip arthroplasties (THAs) since 2002 (459 cases total). All patients underwent computer-assisted surgery at the same institution. No statistical difference in comorbidities existed between groups. The THAs involved 212 posterior approaches and 11 anterior. High-viscosity Dermabond and a 4-gauge Monocryl subcuticular suture (Ethicon) were used in 250 cases (143 TKAs beginning in May 2004 and 107 THAs beginning in January 2004), and surgical staples were used in 209 controls (93 TKAs, 116 THAs) performed before the test cases. Deep fascia and subcutaneous layers in all case and control wounds were prepared with Vicryl sutures (Ethicon). All patient data were prospectively gathered in a computerized database and then retrospectively reviewed. Variables analyzed at 2- and 6-week follow-ups included deep infection, superficial infection, stitch reaction, abnormal redness, blisters, drainage, and dehiscence. Infection rates were calculated according to definitions of deep infection (débridement was required) and superficial infection (antibiotics were prescribed).[10] Wound closure time was determined by measuring time to closure beginning with release of the tourniquet used during TKAs (closure time data were not completed for THAs). Clinical exclusion criteria were not applied.

## Results

The case group (250 patients; mean age, 65 years) consisted of 97 men and 153 women, and the control group (209 patients; mean age, 64 years) consisted of 75 men and 134 women. Neither group developed any deep infections. According to $\chi^2$ analysis, the case–control difference in incidence of superficial infections at 2- and 6-week follow-up was not statistically significant (Table). There was no more evidence of inflammatory response (overt redness, drainage, dehiscence) in the case group than in the control group. Closure time was a mean of 7 minutes longer for case patients than for control patients. Incidence of blisters and stitch reactions was significantly lower for cases than for controls.

## Discussion

Studies of many low-tension applications have shown that Dermabond has significant efficacy. The expectation is that the low infection rate found for low-tension wound closure also will hold for the high-tension closure used in TJA. Results from the present study confirmed that, in minimizing incision-site infections, Dermabond is an equally effective or superior tool. In addition, these results are also valid for patients already compromised by the vascular comorbidities of diabetes, anemia, or rheumatoid arthritis.

In this study, lack of statistical significance for an increase in acute inflammation and infection confirmed that Dermabond is as effective as surgical staples in TJA wound closure and appearance. Furthermore, Dermabond could be considered an improvement with respect to wound care in TJA. Only our control patients developed blisters, in response to the adhesive tape used to protect wounds with staples. This led to statistically significant tape blister reduction in the case group. In addition, staple reactions occurred in the control group (wounds became mildly inflamed).

Given the low national infection rates of less than 2%, we performed a retrospective power analysis. For our $\chi^2$ analysis, a power of 0.80 ($\beta$, 0.20) would require case and control sample sizes of 2500 each, and a power of 0.90 would require 3000 patients in each group. Our combined patient total of 459 is a study limitation.

Wound closure was completed before application of Dermabond—the results being decreased wound tension and less chance that the nonabsorbable material would enter the wound. Underlying tissue was not damaged with this closure method. Although the manufacturer warns against applying the product to skin known to be hypersensitive, there was no recorded evidence of immediate reactions. In the knee incisions, a compressive dressing of gauze and a wrap was applied once the Dermabond dried (dressings were not used in the hip incisions).

With use of high-viscosity Dermabond, closure time increases operating room time slightly, but mostly because a subcuticle suture layer is applied (Figure). However, increased closure time is counterbalanced by time gained during follow-up (no staple removal) and recovery (bathing allowed). Ability to shower and reduced need for wound care (tape, dressings, suture care) increase satisfaction for TJA patients. Dermabond is a superior alternative to surgical staples in the high-tension surgical wound environment of TJA incisions.

## Authors' Disclosure Statement

Dr. Miller reports no actual or potential conflict of interest in relation to this article. Dr. Swank is a consultant for DePuy Orthopaedics; Johnson & Johnson is parent to DePuy and to Ethicon, which makes Dermabond, Monocryl, and Vicryl.

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