The AQUACEL® Surgical Dressing with Ionic Silver Reduces the Rate of Acute Periprosthetic Joint Infection Following Total Joint Arthroplasty

Jenny Cai BS, Joseph A. Karam MD, Javad Parvizi MD, FRCS, Eric B. Smith MD, Peter F. Sharkey MD.

Investigation performed at the Rothman Institute of Orthopaedics at Thomas Jefferson University Hospital, Philadelphia, PA.

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INTRODUCTION

Among the many efforts invested to prevent the occurrence of periprosthetic joint infection (PJI), optimization of wound healing and prevention of wound drainage are important initiatives. The AQUACEL® Ag Hydrofiber® dressing is an antimicrobial dressing which consists of a weaved cellulose center that contours to the skin to eliminate dead space, absorbs exudate and releases ionic silver to reduce microbial activity and support wound healing[1] (Figure 1).

The objective of this study was to evaluate the effect of using this dressing on the occurrence of acute PJI in patients undergoing TJA.

MATERIALS AND METHODS

After obtaining institutional review board approval, retrospective chart review over a 35-month period was undertaken. 903 consecutive patients undergoing primary total joint arthroplasty (TJA) who received the AQUACEL® Ag Surgical dressing were included and compared to 875 consecutive patients undergoing TJA who received the standard dressing. Our major outcome was the development of acute PJI, defined as occurring within 3 months after surgery and verifying the new definition criteria established by the Musculoskeletal Infection Society[2]. The AQUACEL® Ag Surgical dressing was applied on the surgical site in sterile conditions in the operating room and kept for 5 days postoperatively. Standard dressing application consisted of sterile gauze applied over the incision site in the operating room and secured with adhesive tape. Changes in practice and multiple potential confounding factors were taken into account in a multivariate analysis model (Table 1). Statistical analyses were performed using R version 2.15.1 (R Foundation for Statistical Computing®, Vienna Austria).

RESULTS

The prevalence of acute PJI was lower in the AQUACEL® Ag Surgical dressing group (0.44%) compared to the standard dressing group (1.71%). Bivariate analysis showed this to be statistically significant (p=.005). A backward stepwise logistic regression model retained 7 independent risk factors for PJI (out of 37 variables), including the use of AQUACEL® Ag Surgical, with an independent odds ratio of 0.165 (95% confidence interval: 0.051-0.533). Other independent significant risk factors for infection were: age, body mass index, smoking status, thyroid disease, liver disease and history of steroid treatment (Table 2).

Figure 1 AQUACEL® Ag Surgical dressing in place 1 day after total knee arthroplasty.

Demographics:
Age
Gender
BMI

Procedure factors:
Joint
Bilateral procedure
OR time
Transfusion need
Type of anesthesia
Length of stay
AQUACEL® Ag Surgical dressing
Dilute betadine irrigation

Comorbidities:
Smoking status
Frequent alcohol drinking
History of MI
Congestive heart failure
Peripheral vascular disease
Cerebro-vascular disease
Dementia
Chronic pulmonary disease
Connective tissue disease
Coronary artery disease
Peptic ulcer disease
Liver disease
Diabetes mellitus
Chronic renal disease
Malignancy (history, active disease or metastatic disease)
Rheumatoid disease
Hypertension
Dyslipidemia
Thyroid disease
Psychiatric disease
Anemia
Dysrythmia
History of DVT or PE
GERD
History of steroid treatment
ASA

Table 1 List of patient-related and procedure-related factors included in the first step of the logistic regression model.

ASA = American Society of Anaesthesiologists physical status classification, BMI = Body Mass Index, DVT = Deep Vein Thrombosis, GERD = Gastro-Esophageal Reflux Disease, MI = Myocardial Infarction, OR = Operating Room, PE = Pulmonary Embolism.

	Odds Ratio (95% confidence interval)	p-value
AQUACEL® Ag Surgical dressing use	0.17 (0.05 – 0.53)	0.003
Age	1.09 (1.03 – 1.14)	0.002
BMI	1.10 (1.03 - 1.19)	0.006
Former Smoker	3.02 (1.12-8.12)	0.029
Thyroid disease	3.71 (1.42 – 9.67)	0.007
Liver disease	7.03 (1.43-34.60)	0.017
History of systemic steroid treatment	22.22 (1.83 – 269.45)	0.015

Table 2 Factors included in the final logistic regression model with independent odds ratios and 95% confidence intervals.

BMI = Body Mass Index.

DISCUSSION

PJI is a major healthcare concern with mental, physical and financial burden on affected patients. Wound healing problems and superficial surgical site infections have been shown to be a risk factor for the development of PJI[3]. Thus, addressing these specific issues represents an additional weapon in our armamentarium to prevent the occurrence of deep infection.

The use of the AQUACEL® Ag Surgical dressing in TJA has already been shown to decrease the need for dressing changes, thus sparing healthcare resources, prevent superficial wound problems such as blister development, and avoid delays in hospital discharge due to wound healing issues[1]. This is the first study demonstrating that the use of the AQUACEL® Ag Surgical dressing led to a reduction in the incidence of acute PJI after TJA. It appears that the use of this dressing decreases the risk of developing acute PJI by 83%.

We recognize several limitations to our study, principally its retrospective design on a cohort of consecutive patients. Nonetheless, we were able to include a large number of subjects and all changes in practice, as well as potential confounding factors, were taken into account in a multivariate model. Our main concern was the confounding effect of intravenous vancomycin prophylaxis and dilute betadine irrigation, two practices we implemented based on promising evidence in the literature[4,5]. Even though vancomycin use manifested a trend towards significance, these 2 factors did not reach statistical significance for the development of PJI in the current study, probably due to the limited number of subjects involved.

In conclusion, the AQUACEL® Ag Surgical wound dressing with ionic silver signicantly reduces the incidence of acute PJI. Its systematic use would be an effective measure to prevent the occurrence of acute PJI following TJA and thus avoid healthcare costs and major patient morbidity associated with this devastating complication.

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