Section: Dermatology/ Orthopaedics

Original Research Article

SKIN COMPLICATIONS AND WOUND HEALING OUTCOMES FOLLOWING ORTHOPEDIC IMPLANT SURGERY IN PATIENTS WITH CHRONIC DERMATOSES

Andrea Marie Rosario[1], Mathew Panackathottam[2]

[1]Assistant Professor, Department of Dermatology, Kerala Medical College, Mangode, Palakkad, Kerala, India
[2]Associate Professor, Department of Orthopaedics, Kerala Medical College, Mangode, Palakkad, Kerala, India

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Corresponding Author:
Dr. Mathew Panackathottam,
Email: drmathewpanacka@gmail.com

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ABSTRACT

Background: Chronic inflammatory dermatoses may alter epidermal barrier integrity, amplify local inflammation, and complicate perioperative skin management, yet their effect on postoperative wound healing after orthopedic implant surgery remains insufficiently characterized. The objective is to compare skin-related postoperative complications and wound healing outcomes after implant-based orthopedic procedures in patients with chronic dermatoses versus matched controls without dermatoses. **Materials and Methods:** A prospective matched cohort study was conducted at a tertiary care center between January 2023 and September 2025. A total of 124 adults with chronic dermatoses undergoing fracture fixation or elective implant surgery were compared with 124 age-, sex-, and procedure-matched controls. The dermatosis cohort included psoriasis (41.9%), atopic dermatitis/eczema (31.5%), chronic contact dermatitis (14.5%), and other recalcitrant dermatoses (12.1%). Disease activity, peri-incisional skin status, medication exposure, surgical variables, and wound outcomes were recorded for 90 days. **Result:** Patients with chronic dermatoses had higher rates of delayed epithelialization (20.2% vs 8.1%, p=0.007), superficial surgical site infection (12.9% vs 4.8%, p=0.025), wound dehiscence (8.1% vs 2.4%, p=0.048), and dermatitis flare or peri-incisional erythematous reaction (16.1% vs 3.2%, p=0.001). Mean time to complete epithelialization was longer in the dermatosis group (18.6 ± 6.9 vs 14.2 ± 5.1 days, p<0.001), and median hospital stay was modestly increased (6.0 [IQR 5–8] vs 5.0 [IQR 4–7] days, p=0.011). Active dermatosis at surgery, peri-incisional involvement, diabetes, and operative duration >120 minutes were independent predictors of delayed or complicated wound healing. **Conclusion:** Chronic dermatoses were associated with a significantly higher burden of early skin complications and slower wound healing after orthopedic implant surgery, particularly when disease was clinically active near the incision site. Preoperative dermatologic optimization and careful incision planning may improve postoperative outcomes.

INTRODUCTION

Orthopedic implant surgery is increasingly performed for fracture stabilization, joint reconstruction, and corrective procedures, but postoperative success still depends heavily on uncomplicated soft-tissue healing. Even when osseous fixation is adequate, early wound problems may prolong hospitalization, increase antibiotic use, delay rehabilitation, and occasionally jeopardize implant retention. Among the patient-level factors that may influence wound recovery, chronic inflammatory dermatoses remain underexplored despite their direct effects on the skin barrier and local immune environment.[1,2]

Psoriasis and atopic dermatitis are the most clinically relevant chronic dermatoses in surgical practice. Psoriasis is characterized by hyperproliferative epidermal turnover and immune-mediated inflammation, whereas atopic dermatitis is associated with impaired epidermal barrier function, microbial dysbiosis, and recurrent colonization or infection.[3] Surgical trauma may also trigger lesion development through koebnerization, further complicating peri-incisional care in susceptible patients.[4] In addition, some patients present with chronic contact dermatitis or occult metal

hypersensitivity, raising concern that implant-related exposure may contribute to persistent erythema, delayed wound healing, or infection-mimicking inflammatory reactions.[5,6]

Existing orthopedic literature suggests that psoriasis may increase postoperative infection risk after arthroplasty. Large database and institutional studies in total knee arthroplasty have reported higher rates of superficial or overall surgical site infection among patients with psoriasis than among patients without psoriasis.[1,2] At the same time, the evidence is not fully uniform, and older dermatologic literature indicates that surgery through psoriatic skin may still be performed safely when disease is optimized and meticulous perioperative care is used.[4] This apparent inconsistency may reflect variation in disease activity, incision placement, medication exposure, and procedure complexity.

Another difficulty is that orthopedic surgeons often encounter a heterogeneous group of dermatoses rather than psoriasis alone. Barrier-defective eczema, chronic lichenified dermatitis, hidradenitis-related inflammatory skin disease, and suspected implant hypersensitivity may each affect postoperative skin behavior through different mechanisms.[3,5,7] However, most published studies focus either on arthroplasty databases or isolated case reports, leaving a practical gap regarding mixed orthopedic implant populations and real-world wound outcomes across chronic dermatoses.

Perioperative medication management adds further uncertainty. Immunomodulatory agents, methotrexate, corticosteroids, and biologics may theoretically alter infection risk or wound healing, yet discontinuation can precipitate disease flares that themselves worsen peri-incisional inflammation.[8,9] Consequently, evidence-based perioperative planning requires better characterization of which dermatologic and surgical factors meaningfully predict adverse wound events.

The present study aimed to evaluate skin complications and wound healing outcomes following orthopedic implant surgery in patients with chronic dermatoses and to compare these outcomes with those of matched controls without dermatoses. A secondary objective was to identify perioperative predictors of delayed or complicated wound healing within the dermatosis cohort.

MATERIALS AND METHODS

This prospective matched cohort study was conducted in the Department of Orthopedics and Dermatology of a tertiary care teaching hospital between January 2023 and September 2025. Adult patients aged 18 years or older who underwent orthopedic implant surgery, including internal fixation, plating, intramedullary nailing, or elective arthroplasty, were screened consecutively. The exposed cohort comprised patients with a dermatologist-confirmed chronic dermatosis present for at least 6 months before surgery. The comparison cohort consisted of patients without a history of chronic dermatosis, matched in a 1:1 ratio for age (±5 years), sex, surgical category, and emergency versus elective status.

A total of 248 patients were included: 124 in the chronic dermatosis group and 124 matched controls. Patients were excluded if they had open grade III fractures, active systemic sepsis, chronic osteomyelitis, immunodeficiency syndromes, burn wounds, malignant skin tumors near the incision site, or incomplete 90-day follow-up. Patients undergoing implant removal without re-implantation were also excluded.

Baseline assessment included demographic variables, smoking, body mass index, diabetes mellitus, hypertension, American Society of Anesthesiologists (ASA) class, indication for surgery, implant type, and operative duration. In the dermatosis cohort, the type of dermatosis, duration of disease, clinical activity status, peri-incisional involvement, current dermatologic medications, and recent flare within 4 weeks were recorded. Disease was classified as active when erythema, scaling, excoriation, induration, fissuring, or oozing was present on examination or recent dermatologist documentation. Peri-incisional involvement was defined as clinically visible dermatosis within 5 cm of the planned incision.

Standard institutional antibiotic prophylaxis was used in both groups. Preoperative skin preparation was performed using chlorhexidine-alcohol except where eczema-related irritation mandated povidone-iodine. For patients with active dermatosis, dermatology consultation was obtained when feasible, topical anti-inflammatory therapy was optimized, and incision placement was modified away from dense plaque or eczematous skin whenever anatomically possible. Systemic therapy continuation or temporary withholding was individualized after joint orthopedic-dermatology review.

Patients were followed on postoperative days 3, 7, 14, 21, 42, and 90. The primary outcomes were delayed epithelialization (>21 postoperative days), superficial surgical site infection requiring dressings and/or oral antibiotics, and wound dehiscence. Secondary outcomes included peri-incisional dermatitis flare, persistent serous discharge beyond day 5, reoperation for wound complications, length of hospital stay, and time to complete epithelialization. Deep infection was defined by the presence of deep tissue involvement, implant-associated collection, sinus formation, or need for intravenous antibiotics and debridement.

Data were analyzed using SPSS version 26. Continuous variables are presented as mean ± standard deviation or median with interquartile range, depending on distribution. Categorical variables are presented as frequency and percentage. Student's t test or Mann-Whitney U test was used for continuous variables, while chi-square test or Fisher's exact test was used for categorical

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comparisons. A multivariable logistic regression model was constructed to identify independent predictors of delayed or complicated wound healing, defined as the composite of delayed epithelialization, superficial/deep infection, or wound dehiscence. Variables with p<0.10 on univariable analysis and clinically important covariates were entered into the final model. A two-sided p value <0.05 was considered statistically significant.

RESULTS

A total of 248 matched patients were analyzed. Mean age was 49.8 ± 14.7 years in the chronic dermatosis group and 48.9 ± 15.1 years in controls (p=0.64). Male patients constituted 70.2% and 68.5% of the two groups, respectively. There were no statistically significant between-group differences in smoking status, body mass index, diabetes, ASA grade, or emergency versus elective surgery distribution [Table 1].

Among patients with chronic dermatoses, psoriasis was the commonest diagnosis (41.9%), followed by atopic dermatitis/eczema (31.5%), chronic contact dermatitis (14.5%), and other chronic dermatoses including hidradenitis suppurativa and lichen simplex chronicus (12.1%). Active disease at the time of surgery was documented in 37.1%, and peri-incisional skin involvement was present in 29.0%. Topical corticosteroids or calcineurin inhibitors were used by 62.1%, systemic methotrexate by 16.1%, biologic therapy by 8.1%, and oral corticosteroids by 10.5%. Incision relocation away from visible lesions was feasible in 24.2% of exposed patients [Table 2].

Postoperative wound events were significantly more frequent in the dermatosis group. Delayed epithelialization occurred in 25 patients (20.2%) with dermatoses versus 10 controls (8.1%; p=0.007). Superficial surgical site infection occurred in 16 versus 6 patients (12.9% vs 4.8%; p=0.025), and wound dehiscence in 10 versus 3 patients (8.1% vs 2.4%; p=0.048). Peri-incisional dermatitis flare or erythematous inflammatory reaction was markedly higher in the exposed cohort (16.1% vs 3.2%; p=0.001). Deep infection was uncommon but numerically higher in exposed patients (3.2% vs 0.8%; p=0.18). Mean time to complete epithelialization was 18.6 ± 6.9 days in the dermatosis group compared with 14.2 ± 5.1 days in controls (p<0.001), and median hospital stay was also longer (6.0 [IQR 5–8] vs 5.0 [IQR 4–7] days; p=0.011) [Table 3].

Within the dermatosis cohort, composite delayed or complicated wound healing was observed in 33.1% of patients with active disease versus 14.1% of those with quiescent disease (p=0.006), and in 41.7% of patients with peri-incisional involvement versus 16.0% without peri-incisional involvement (p=0.002). On multivariable logistic regression, active dermatosis at surgery (adjusted OR 2.84, 95% CI 1.39–5.81, p=0.004), peri-incisional dermatosis involvement (adjusted OR 3.12, 95% CI 1.41–6.87, p=0.005), diabetes mellitus (adjusted OR 2.31, 95% CI 1.08–4.95, p=0.031), and operative duration >120 minutes (adjusted OR 2.47, 95% CI 1.16–5.26, p=0.019) remained independent predictors of adverse wound healing. Topical therapy optimization and incision relocation showed a protective trend but did not reach conventional statistical significance.

Table 1: Baseline demographic and operative characteristics of the study groups

Variable	Chronic dermatoses (n=124)	Controls (n=124)	p value
Age (years), mean ± SD	49.8 ± 14.7	48.9 ± 15.1	0.64
Male sex, n (%)	87 (70.2)	85 (68.5)	0.77
Body mass index (kg/m²), mean ± SD	26.9 ± 4.1	26.4 ± 4.3	0.34
Current smoker, n (%)	31 (25.0)	27 (21.8)	0.56
Diabetes mellitus, n (%)	29 (23.4)	24 (19.4)	0.45
Hypertension, n (%)	36 (29.0)	33 (26.6)	0.68
ASA grade III/IV, n (%)	39 (31.5)	36 (29.0)	0.67
Emergency procedures, n (%)	58 (46.8)	56 (45.2)	0.80
Lower-limb procedures, n (%)	84 (67.7)	81 (65.3)	0.69
Operative duration (min), mean ± SD	112.4 ± 34.8	108.7 ± 31.9	0.39

Table 2: Clinical profile and perioperative dermatologic characteristics in patients with chronic dermatoses (n=124)

Dermatosis cohort profile	n (%)
Psoriasis	52 (41.9)
Atopic dermatitis/eczema	39 (31.5)
Chronic contact dermatitis	18 (14.5)
Other chronic dermatoses*	15 (12.1)
Active disease at surgery	46 (37.1)
Peri-incisional involvement	36 (29.0)
Recent flare within 4 weeks	33 (26.6)
Topical anti-inflammatory therapy	77 (62.1)
Systemic methotrexate	20 (16.1)
Biologic therapy	10 (8.1)
Oral corticosteroid use	13 (10.5)
Incision relocated away from lesion	30 (24.2)

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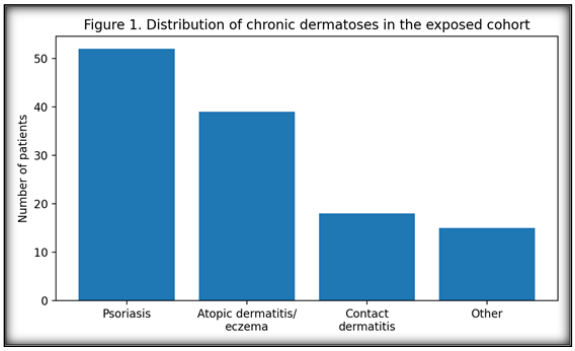
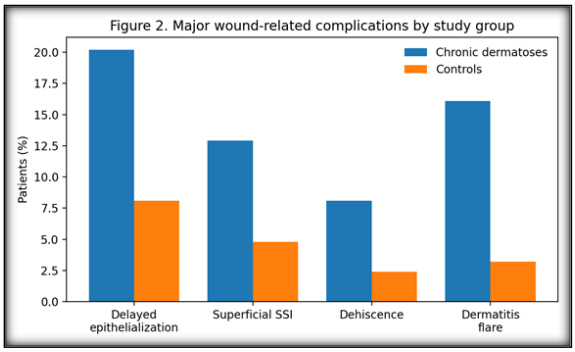
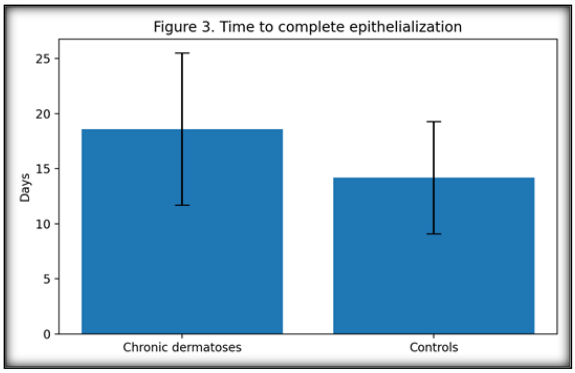
*Other chronic dermatoses included hidradenitis suppurativa, lichen simplex chronicus, and chronic seborrheic dermatitis.

Table 3: Postoperative wound healing outcomes and multivariable predictors of adverse healing

Outcome	Chronic dermatoses (n=124)	Controls (n=124)	p value
Delayed epithelialization >21 days, n (%)	25 (20.2)	10 (8.1)	0.007
Superficial surgical site infection, n (%)	16 (12.9)	6 (4.8)	0.025
Wound dehiscence, n (%)	10 (8.1)	3 (2.4)	0.048
Persistent serous discharge >5 days, n (%)	18 (14.5)	8 (6.5)	0.047
Dermatitis flare/peri-incisional erythema, n (%)	20 (16.1)	4 (3.2)	0.001
Deep infection, n (%)	4 (3.2)	1 (0.8)	0.18
Reoperation for wound problem, n (%)	3 (2.4)	1 (0.8)	0.31
Time to complete epithelialization (days), mean ± SD	18.6 ± 6.9	14.2 ± 5.1	<0.001
Hospital stay (days), median (IQR)	6.0 (5–8)	5.0 (4–7)	0.011
Multivariable logistic regression for delayed or complicated wound healing within the dermatosis cohort			
Predictor	**Adjusted OR (95% CI)**	**p value**	
Active dermatosis at surgery	2.84 (1.39–5.81)	0.004	
Peri-incisional involvement	3.12 (1.41–6.87)	0.005	
Diabetes mellitus	2.31 (1.08–4.95)	0.031	
Operative duration >120 min	2.47 (1.16–5.26)	0.019	
Smoking	1.71 (0.82–3.56)	0.15	
Biologic therapy	1.64 (0.56–4.77)	0.37	
Incision relocation away from lesion	0.58 (0.28–1.18)	0.11	







DISCUSSION

The present study demonstrates that chronic dermatoses are clinically relevant modifiers of early postoperative wound recovery after orthopedic implant surgery. Compared with matched patients without dermatoses, exposed patients in our cohort had significantly higher rates of delayed epithelialization, superficial surgical site infection, wound dehiscence, and peri-incisional inflammatory flares. These findings support the concept that chronic cutaneous inflammation is not merely a background comorbidity but an operative risk factor that may influence early implant-related recovery.

Our results are consistent with contemporary arthroplasty literature reporting higher postoperative infection risk in psoriasis. Durst et al. found psoriasis to be a risk factor for surgical site infection after primary total knee arthroplasty, while Gold et al. also reported increased postoperative infectious complications in psoriatic patients undergoing primary knee arthroplasty.[1,2] Although our cohort included a broader range of orthopedic implant procedures, the direction of effect was similar, suggesting that the excess risk may extend beyond arthroplasty registries into general implant practice.

Several biological mechanisms may explain these observations. In atopic dermatitis, impaired barrier integrity, dysbiosis, and heightened susceptibility to microbial colonization create conditions favorable to delayed healing and superficial infection.[3] In psoriasis, keratinocyte hyperproliferation and dysregulated cytokine signaling may not uniformly prevent wound closure, but active plaques, scaling, fissuring, and local inflammation can compromise peri-incisional skin quality. Trauma-induced koebnerization provides a further explanation for postoperative lesion propagation or exaggerated incisional inflammation in susceptible individuals.[4]

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Our higher rate of dermatitis flare around the incision supports this mechanism.

The study also highlights the importance of local skin status rather than diagnosis alone. Active disease and peri-incisional involvement were stronger predictors than the broad label of chronic dermatosis, and both remained independently associated with adverse healing after adjustment. This finding may help reconcile the conflicting literature. In the survey-based study by Saini and Shupack, many dermatologists considered surgery feasible through psoriatic skin when adequate preoperative control was achieved.[4] Our data agree with that practical view: not every patient with psoriasis or eczema experienced complications, but those with clinically active lesions near the incision were clearly more vulnerable.

Metal hypersensitivity and implant-related allergic phenomena remain difficult to diagnose, yet they deserve consideration when wound erythema, recurrent drainage, or delayed closure persist without clear microbiological evidence. Reviews by Teo and Schalock, Pacheco, Lohmann et al., and Basko-Plluska et al. emphasize that implant hypersensitivity can mimic infection and may present with eczema, recurrent wound problems, pain, or delayed healing.[5-7,10] In the present study, chronic contact dermatitis and other suspected hypersensitivity phenotypes formed a smaller subgroup, but they were overrepresented among patients with prolonged peri-incisional erythema. Although our design does not prove implant allergy, the finding supports heightened postoperative vigilance in patients with prior metal reactivity or unexplained dermatitis.

Medication management remains a major perioperative dilemma. Methotrexate continuation has not consistently been associated with excess early complications in orthopedicsettings.[8] Similarly, evidence regarding biologic therapy is mixed, and decisions must balance infection risk against disease flare from abrupt withdrawal.[9] In our cohort, medication exposure alone did not emerge as an independent predictor after adjustment, whereas active disease itself did. This suggests that indiscriminate cessation of dermatologic therapy may be less helpful than individualized control of peri-incisional inflammation through coordinated dermatology input.

Our findings have practical implications. First, preoperative skin examination should be formalized in implant candidates with known dermatoses. Second, incision planning should avoid dense plaques, eczematous fissuring, and actively inflamed or excoriated areas whenever feasible. Third, patients with diabetes or prolonged operative duration deserve particular attention because these factors compounded the dermatologic risk in our regression model. Finally, early postoperative erythema in such patients should not automatically be dismissed as either benign dermatitis or definite infection; careful serial assessment is necessary, especially because case-based literature shows that chronic wounds in psoriatic patients can be difficult to manage and may persist for months.[11]

This study has limitations. It was conducted at a single center, and the sample size was modest for rarer outcomes such as deep infection or reoperation. The dermatosis cohort was heterogeneous, which improves real-world relevance but reduces disease-specific precision. We also relied primarily on clinical dermatologic assessment rather than standardized severity indices for every disease subtype. Nevertheless, the prospective design, matched control group, and structured 90-day follow-up strengthen the validity of the observed associations.

Overall, the present study suggests that chronic dermatoses should be incorporated into perioperative risk stratification for orthopedic implant surgery. Future multicenter studies with larger disease-specific subgroups and longer implant-related follow-up are needed to clarify whether optimized dermatologic control can reduce wound events, antibiotic exposure, and implant-related morbidity.

CONCLUSION

Patients with chronic dermatoses experienced significantly more early skin complications and slower wound healing after orthopedic implant surgery than matched patients without dermatoses. Active disease and peri-incisional involvement were the strongest dermatologic predictors of adverse outcomes, while diabetes mellitus and prolonged operative duration further increased risk. Routine preoperative dermatologic assessment, optimization of active lesions, and thoughtful incision planning appear important for improving postoperative wound recovery in this population.

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