

## Original research

## SKINTED: A Rare Complication After Total Knee Arthroplasty

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## ARTICLE INFO

## Article history:

Received 30 July 2020

Received in revised form

5 October 2020

Accepted 17 October 2020

Available online 20 November 2020

## Keywords:

Dermatitis

Hypoesthesia

Infrapatellar branch of the saphenous nerve

Neuropathy

SKINTED

Total knee arthroplasty

## ABSTRACT

**Background:** Surgery of the knee, injury to the infrapatellar branch of the saphenous nerve, traumatic eczematous dermatitis is a neuropathic dermatitis specific to total knee arthroplasty (TKA), occurring around the healed surgical scar area. Very few case reports exist in orthopaedic literature regarding this rare skin complication after TKA. We report a series of cases and estimated the incidence of this condition in our institute.

**Methods:** During the 1-year period from January 2018 to December 2018, patients who have undergone TKA and later presented with skin lesions adjacent to the operated site were identified. Detailed history was taken, and full clinical examination was performed for all the reported cases.

**Results:** A total of 9 lesions in 8 patients were identified out of a total of 203 consecutive TKAs operated during the study period, with an estimated incidence of 4.4%. The mean age was 64 years (range, 58–78 years). The mean time from surgery to diagnosis was 4 months (range, 3–6 months).

**Conclusions:** This group of dermatitis caused due to surgical transection of the infrapatellar branch of the saphenous nerve during TKA is a rare cutaneous complication, with an estimated incidence of 4.4% from this study. Lesions typically appear lateral to the operative scar within an area of hypoesthesia. Lesions in all patients improved after topical steroid therapy with no recurrences at further follow-up. Arthroplasty surgeons should have awareness of this benign complication, thereby avoiding unwarranted additional workup and alleviating unnecessary psychological stress to the patient.

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## Introduction

Total knee arthroplasty (TKA) is one of the most common elective operations around the world and is estimated to have exponential increase in demand in the near future [1]. The standard surgical approach for TKA is a midline skin incision with medial parapatellar arthrotomy [2]. During this approach, the infrapatellar branch of the saphenous nerve (IPBSN) is transected, resulting in an area of altered sensation lateral to the incision, ranging from mild paresthesia to complete anesthesia [3–8]. In few cases, a cutaneous lesion may occur in this area of altered sensation [9–14]. The exact incidence of this

complication is not described in the literature until now. Similar skin lesions after surgical nerve injury were described after arthroscopic debridement of the medial meniscal cyst [15], after different flap surgeries [16] and also along the saphenous vein graft harvest scar site after coronary artery bypass grafting [11,12,17]. Various terminologies were described by different authors, such as surgery of the knee, injury to infrapatellar branch of the saphenous nerve, traumatic eczematous dermatitis (SKINTED) [10]; neuropathy dermatitis [11]; and autonomic denervation dermatitis (ADD) [12]. We prefer to use the term SKINTED as it is specific to TKA surgery and hereby describe a series of patients presenting with SKINTED.

## Material and methods

During the 1-year period from January 2018 to December 2018, patients who have undergone TKA at our institute and later

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presented to the outpatient department with complaints of skin lesions adjacent to the operative site were identified. Detailed history was taken, and full dermatological examination was performed. These patients were followed up until December 2019. Institutional review board approval was obtained for the study.

There are no comparative statistics included, given the nature of this case series. Descriptive data are presented as mean values with ranges. We estimated the incidence based on the number of new lesions identified compared with the number of TKAs operated during the study period.

## Results

A total of 203 TKAs were performed in 148 patients (bilateral TKA in 55 patients and unilateral TKA in 93 patients) during the 1-year study period. All the patients were operated by the primary author by the medial parapatellar approach, using posterior-stabilized fixed-bearing prosthesis (PFC Sigma, DePuy Orthopedics, Warsaw) implanted with cement (PALACOS R + G, Heraeus Medical, Germany). The femoral component was made of cobalt-chromium, the tibial component was made of titanium, and the insert was made of ultrahigh-molecular-weight polyethylene. Wound closure was performed with skin staples and sealed with an occlusive polyurethane film (Tegaderm, 3M, Saint Paul, MN). Adhesive strips or adhesive glue with mesh dressings were not used in any of our patients. None of our patients reported allergic skin reaction to the dressing used.

Eight patients (7 women and one man) presented to our outpatient department with 9 lesions (one bilateral lesion) lateral to the healed incision scar. The mean age of the patients was 64.5 years (range, 58–78 years). The mean time from surgery to diagnosis was 4 months (range, 3–6 months).

A detailed history was taken from each patient. All these patients had an uneventful postoperative period with well-functioning knees at the time of presentation of skin lesions. They did not give any history of the use of any topical agent/contact allergen during the preoperative and postoperative periods. There was no prior history of metal allergy or other allergic conditions, diabetic neuropathy, chronic liver, and renal conditions in any of the reported patients. All the patients reported varying degrees of sensory loss lateral to the surgical site. The rash was reported to start as a small, nonpruritic, red scaly lesion and gradually increased in size over few weeks. Pruritus over the lesion was reported by 5 patients as the eruption increased in size.

Full dermatological evaluation was performed for each patient by the dermatologist. Appearance of the lesions varied from a small scaly erythematous plaque to a large area of scaly erythematous patch or a large pigmented patch (Table 1). The eruption exclusively occurred lateral to the midline skin incision, corresponding to the region of innervation of the IPBSN. The rash never crossed the midline scar onto the medial side. The size of the lesions varied

from 3 cm × 2 cm to 12 cm × 10 cm at the time of presentation (Figs. 2–4). There was no local rise of temperature or tenderness over the rash. Sensory examination revealed altered sensation (hypoesthesia to anesthesia) on the lateral side of the scar, whereas there was normal sensation on the medial side of the scar. Borders of the hypoesthetic skin were identified using light touch and pinprick testing. In all cases, the eczematous rash was within the hypoesthetic area. There were no skin lesions in any other part of the body. There were no signs of venous stasis. All patients had stable, well-functioning knees, with the mean Knee Society Score being 90 (range, 84–94).

Complete blood counts and serum biochemistry in all cases were within the normal reference range. Radiographs demonstrated appropriate position and fixation of the cemented implants. Incisional biopsy of the lesions was performed in the first 3 patients, and the histopathology pictures were similar and consistent with subacute spongiotic dermatitis. As the lesions were very similar in the other cases, we deferred further histopathological examination. The epidermis showed mild hyperkeratosis with focal basal vacuolar degeneration, and the superficial dermis showed perivascular infiltrate of lymphocytes along with few eosinophils (Fig. 5). Periodic acid-Schiff stain was negative for fungal organism. As the clinical presentation and histopathology picture were matching with previous published articles, a diagnosis of SKINTED was made. The estimated incidence was 4.4% (9 lesions/203 TKAs).

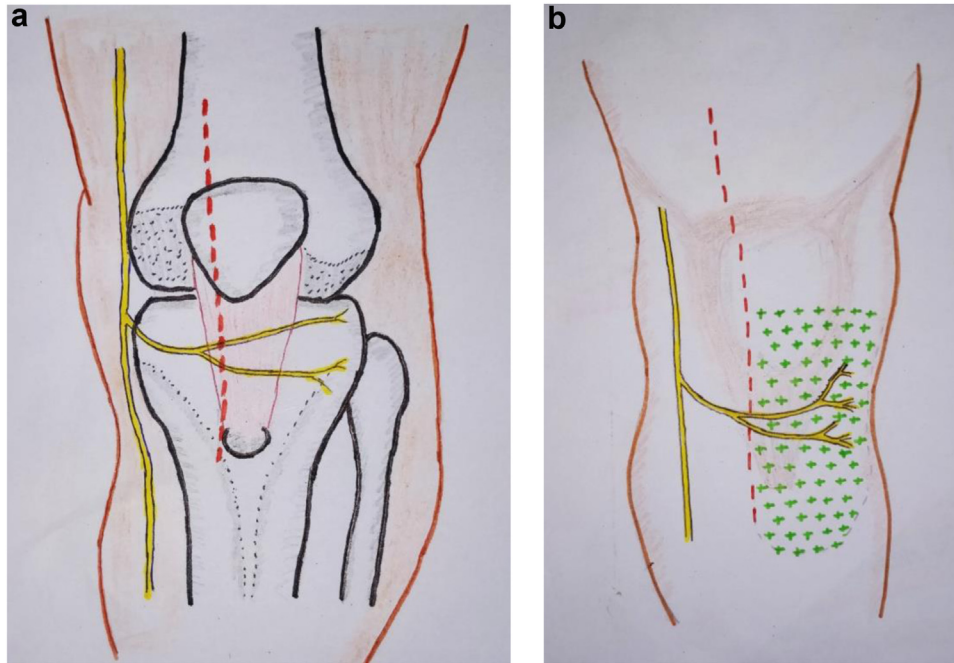
With normal clinical, hematological, and biochemical findings, prosthetic and superficial infections were ruled out as a cause of this dermatological condition. Our patients were prescribed mid-potent topical steroid cream application twice daily, along with topical emollient application thrice daily. Patients with pruritus were prescribed oral antihistamine drugs for 5 days. Our treatment protocol did not involve any other medications. Five of the 9 lesions healed completely within 6 weeks. The rest of the lesions also healed completely within 10 weeks. All the patients were followed up for at least 6 months from the initial presentation, and there was no recurrence of lesions in any of the patient. The patients had gradual improvement in sensation in the areas of hypoesthesia over few months.

## Discussion

The IPBSN is a purely sensory nerve that crosses from medial to lateral in the infrapatellar area, supplying cutaneous sensation to the inferolateral knee area (Fig. 1a). Variations of its course and the branching pattern have been described in various anatomical studies [3,8]. Iatrogenic injury of the IPBSN has been described within orthopaedic literature during several knee surgical procedures, including TKA. The nerve was encountered in all knees with a mean distance of 2.82 cm distal to the inferior pole of the patella during primary TKA in a study by James et al [4]. The incidence of IPBSN injury during TKA ranges from 85% to 100%

**Table 1**  
Patient and skin lesion characteristics in our study.

Age/sex	Surgery	Description of skin lesion noted	Time lag surgery to dermatitis	Time taken for complete healing of the lesion
60/F	Left TKA	3 × 2 cm, scaly erythematous patch left knee, nonpruritic	3 mo	4 wk
72/F	B/L TKA	6 × 4 cm, scaly erythematous plaque right knee, pruritic	3 mo	5 wk
59/F	Right TKA	4 × 3 cm, scaly erythematous plaque right knee, pruritic	4 mo	5 wk
65/F	B/L TKA	7 × 6 cm, scaly erythematous plaque right knee, pruritic	3 mo	6 wk
		5 × 4 cm, scaly erythematous plaque left knee, pruritic	4 mo	4 wk
78/F	B/L TKA	10 × 8 cm, scaly erythematous patch right knee, nonpruritic	4 mo	7 wk
63/M	Right TKA	11 × 9 cm, hyperpigmented scaly patch right knee, pruritic	5 mo	10 wk
58/F	Right TKA	12 × 10 cm, hyperpigmented scaly patch right knee, nonpruritic	6 mo	9 wk
61/F	B/L TKA	7 × 6 cm, scaly erythematous plaque left knee, pruritic	4 mo	7 wk



**Figure 1.** (a) Illustration of the left knee showing saphenous nerve descending along the medial side of the knee and its infrapatellar branch crossing the midline between the patella and tibial tubercle. In this figure, 2 branches cross the midline, which is the most commonly seen branching pattern. (b) Illustration of the 9 left knee showing area of hypoesthesia after TKA midline incision transecting the infrapatellar branch.

according to various studies [5,6]. This leads to an area of sensory disturbance in its distribution lateral to the incision (Fig. 1b). This can interfere with postoperative patient satisfaction necessitating counseling by the surgeon [7]. Rarely, cutaneous eruptions can

develop within this hypoesthetic area [9–14]. The rash appeared 3 to 6 months after surgery and is characterized by a scaly erythematous patch or plaque. There may be anatomical variations of this nerve in different patients and also on either side of the same patient, hence explaining why not all patients undergoing TKA develop this eruption and why it is often unilateral in patients with bilateral TKA [8].

Satku et al [9] in 1993 were the first to describe about dermatitis complicating the anesthetic area after TKA in 3 patients, and they concluded that loss of sensory and autonomic function might be the contributory cause. Verma and Mody [10] in 2009 postulated that damage to the cutaneous nerve during surgery alters the barrier function of the epidermis, resulting in transepidermal water loss, causing xerosis, and the eventual development of an eczematous dermatitis. They proposed the term SKINTED for lesions occurring after TKA. Sharquie et al in 2010 suggested the term neuropathy dermatitis for rash occurring in the postsurgical area with nerve transection. They speculated that at the time of nerve regeneration, nerve terminals release neuropeptides such as substance P, vasoactive intestinal peptide, and neurotensin, which play important role in immunomodulation and keratinocyte functioning. These neuropeptides participate in regulation of immediate and delayed-type hypersensitivity reactions in the skin, thereby contributing to the development of cutaneous inflammatory disorders [11]. The cutaneous autonomic nervous system plays a crucial part in regulating sweat gland function, vasomotor activity, and skin blood flow, which in turn maintain the normal skin barrier. Acetylcholine and catecholamines released from autonomic nerve endings also play an important role in keratinocyte functioning [18,19]. Madke et al [12] in 2017 suggested the term ADD for the trophic changes in the skin after denervation of various autonomic organs of the skin. SKINTED is a site- and procedure-specific diagnosis, whereas the terms neuropathy dermatitis and ADD are applicable to all eczematous eruptions at or around surgical sites irrespective of the site and nature of the operative procedure.



**Figure 2.** Photograph of the right knee showing a scaly erythematous plaque lateral to the midline scar.



**Figure 3.** Photograph of the right knee showing large hyperpigmented patch lateral to the midline scar.

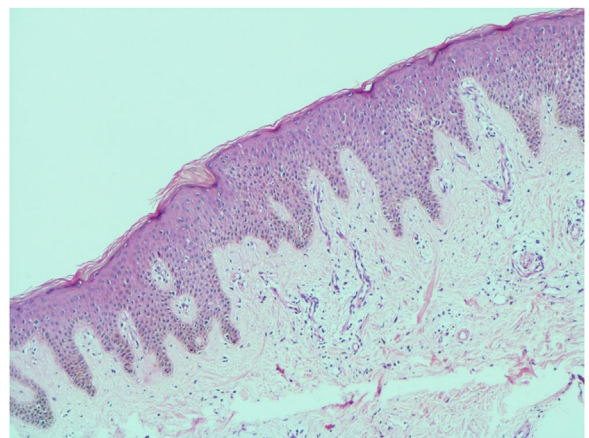


**Figure 4.** Photograph of right knee showing scaly erythematous patch lateral to the midline scar.

In the approach to a patient with eczematous rash limited to TKA surgical site allergic contact dermatitis, surgical site infection and metal allergy must be considered along with SKINTED. Allergic contact dermatitis is recognized based on its geographic pattern corresponding to the location of placement of the offending agent, presenting acutely within 5 to 14 days after exposure, with characteristic appearance of intensely pruritic erythematous papules, vesicles, and bullae [20]. Surgical site infection presents with classical signs and symptoms of increased surgical site pain, warmth, wound drainage, and fever.

Metal hypersensitivity dermatitis may mimic SKINTED [10,21]. Metal hypersensitivity is a rare complication after TKA and is usually a diagnosis of exclusion. Patients typically present with periprosthetic synovitis and swelling, and less frequently with an eczematous dermatitis that may be local or generalized, extending to the neck, buttock, and extremities. The dermatitis is characterized by an erythematous, papular, pruritic, and scaly rash that may appear on either side of the surgical scar. The rash occurs between 2 months and 2 years postoperatively. The patients may report a family history or prior history of allergy to metals. The rash responds well to topical steroids, but recurrences are common [22,23]. This is in contrast with clinical presentation of SKINTED, where lesions appear only lateral to the scar within an area of hypoesthesia, lesions have less-intense pruritus, and recurrence after treatment is uncommon.

The diagnosis of SKINTED is largely clinical, based on the typical presentation of rash. It has a benign course, well managed with topical steroids and resolves in few weeks without recurrence.



**Figure 5.** Photomicrograph (H&E stain, ×100 magnification) showing hyperkeratosis with basal vacuolar degeneration along with perivascular lymphocytosis in superficial dermis.

## Conclusion

We have used the term 'SKINTED' to describe a focal region of dermatitis that occurs in an area of hypoesthesia adjacent to the incision, due to transection of the IPBSN, with an estimated incidence of 4.4%. It has a benign course with good response to topical steroids.

This condition is under-recognized and under-reported, with only a few cases reported in orthopaedic literature. Arthroplasty surgeons should be aware of this potential benign complication and adequately counsel the patients, thus alleviating unnecessary psychological stress.

## Conflict of interests

The authors declare there are no conflicts of interest.

## Acknowledgments

The authors would like to acknowledge the contribution of the Department of Pathology, Kerala Institute of Medical Sciences.

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