

## Delineating the Boundaries of Superficial Lymphangitis: A Retrospective Study of 11 Cases with a Review of Literature

### Abstract

**Background:** Lymphangitis is an inflammation of lymphatic channels caused by infectious or non-infectious agents, presenting with characteristic linear erythematous streaks draining toward regional lymph nodes. **Objective:** To describe the clinical characteristics and etiological factors involved in acute superficial lymphangitis in a retrospective descriptive study. **Materials and Methods:** Records of patients were analyzed retrospectively who presented with linear erythematous streaks, diagnosed as superficial lymphangitis, in the outpatient department of dermatology during the last 5 years (January 2018–December 2022) in a tertiary care hospital. Patients were evaluated for their demographic profile, detailed history, complete physical examination, and standard blood tests (if necessary). **Results:** A total of 11 patients were found, out of which 7 (63%) were males and 4 (37%) were females. The mean/median age of these patients was 30 years (range 9–52 years). The minimum duration of development of lymphangitis was within minutes in the case of a mosquito bite reaction and around 72 hours in the case of trauma or infection induced, with a median interval of 48 hours. The site most commonly involved was the upper extremity in 8 (72%) patients, followed by the trunk in 2 (18%) and the lower extremity in 1 (9%). Arthropod bite reactions (63%) were the most common etiological agent. All patients presented with linear erythematous streaks extending towards draining lymph nodes. **Conclusion:** Lymphangitis is often considered to be a bacterial infection and is mostly treated with antibiotics; however, non-bacterial and non-infectious causes should be kept in mind while treating superficial lymphangitis to make judicious use of systemic antibiotics.

**Keywords:** Arthropod bite, infections, lymphangitis

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### Introduction

Lymphangitis is an inflammation of lymphatic channels caused by infectious or non-infectious agents. Bacterial infection was once considered the only etiology of lymphangitis; hence, all patients were treated with antibiotics, but now it is clear that non-bacterial infections, including viruses, fungi, and parasites, and even non-infectious agents like arthropod bites and allergic sensitisation may cause lymphangitis.<sup>[1]</sup> Lymphangitis presents as linear erythematous streaks extending towards the draining lymph nodes, sometimes giving the appearance of fascinating comet tails. There is a dearth of lymphangitis literature stipulating exploration. Thus, we present a bird's-eye view of this rare entity, describing 11 patients with varied etiologies.

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### Materials and Methods

We collected the records of patients who presented with linear erythematous streaks and were diagnosed as having superficial lymphangitis in the outpatient department of dermatology during the last 5 years (January 2018–December 2022) in a tertiary care hospital. The evaluation included a demographic profile, a detailed history, a complete physical examination, and standard blood tests (if required). A skin biopsy was not done considering the mildly self-limiting nature of the entity.

### Results

We found 11 patients diagnosed with lymphangitis, and a detailed description of their clinico-demographic characteristics is given in Table 1. Seven (63%) of these patients were male, including 1 male child.

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**Table 1: Clinico-demographic characteristics of lymphangitis patients**

Age (years) and Gender (M/F)	Presentation	Time of onset (hrs)	Clinical presentation
20, F	History of trauma to right thumb. After 3 days, developed painless linear streak over right forearm	72	Superficial ulcer of size about 0.5 × 0.5 cm over dorsum of right thumb distal to proximal nail fold and linear erythematous streak of size about 15 × 0.5 cm starting from dorsum of right wrist, ramifying at proximal forearm extending upto volar aspect of elbow
24, M	Presented with nodular swellings over legs, feet, and left forearm and was diagnosed with erythema nodosum secondary to streptococcal pharyngitis. After 2 days, noticed reddish linear streaks over left forearm	48-72	Erythematous tender nodules over bilateral feet, lateral aspects of legs, and single nodule over medial aspect of left distal forearm. Erythematous linear non-tender streak of size about 20 cm × 0.5 cm extending from forearm nodule to volar aspect of distal arm along the draining veins with intermittent skip areas of normal skin
35, M	History of unknown insect bite over dorsum of left wrist followed by intense pain over left upper limb, high-grade fever, and multiple red linear streaks over forearm ×1 day	<24	Insect bite mark with central punctum over dorsum of left wrist. Linear multiple streaks of size about 50 × 0.5 cm extending from dorsum of wrist to axilla through volar aspect of forearm and arm with tender axillary lymphadenopathy  Blood investigations including CHG, CRP, RFTs, LFTs and urine for routine and microscopy were normal
9, Mch	After child complained of pruritus over chest, mother noticed linear red streaks over chest and upper abdomen ×1 day	---	Two linear streaks originating from epigastric region spanning in the chest bilaterally extending upto nipples. On examination of child, insect bite marks were noticed along with post inflammatory pigmentation suggestive of papular urticaria
18, F	History of insect bite followed by pruritus and development of linear rash over left arm×1 day	<12	Single bite mark with excoriation over lateral aspect of left lower arm. Linear erythematous streak of size about 15 cm × 0.5 cm extending from insect bite site to medial proximal arm
30, F	Suspected patient of cutaneous tuberculosis was injected intradermal tuberculin antigen (0.1 ml). After 2 days, noticed central dusky hue with 3 red linear streaks	48-72	Central necrotic area of size about 3 × 2.5 cm surrounded by erythema and 3 linear erythematous streaks of size about 6-8 × 0.3 cm over volar aspect of right forearm, simulating an octopus
52, M	After 2 days of spider bite, developed redness and painful linear rash over right forearm.  History of low grade fever and malaise	48	Central necrotic area of size about 0.4 cm diameter surrounded by ill-defined tender dusky erythema of size about 3 × 2 cm and faint erythema of size about 10 × 6 cm over volar aspect of right forearm extending as linear streak of erythema of size about 20 × 2 cm to medial aspect of upper arm with tender axillary lymphadenopathy.  Blood investigations showed TLC- 12.5 × 10 <sup>3</sup> /mL, DLC-75/21/3/1/0 (neutrophils/lymphocytes/eosinophils/monocytes/basophils), ESR-14 mm/first hour, CRP- within normal limits
44, M	Within few minutes of mosquito bite, noticed a swelling with tail over right arm	Within minutes	Skin colored to erythematous papule of size about 0.6 cm diameter with trailing end of about 5 cm in length and tapering width with linear undulating course resembling a spermatozoa
36, F	Insect bite, complained of itching over breast and noticed reddish rash ×2 day	----	Erythematous papule of size about 0.5 cm diameter with diffuse erythema of size about 2.5 cm diameter and single linear streak of size about 6 × 0.5 cm over right breast
22, M	After some insect bite over left wrist, complained of mild itching and pain. Next day, noticed painless reddish streak over forearm. No history of fever or systemic symptoms.	24-48	Papule of size about 0.8 cm over lateral aspect of left wrist extending as linear streak of size about 12 × 1 cm over volar aspect of forearm giving comet tail appearance
35, M	After 3 days of trivial trauma to left ankle, noticed reddish linear rash over leg	72-96	Small abrasion of size about 1 × 0.3 cm over dorsal aspect of left ankle. Linear streak extending from medial aspect of lower leg to volar aspect of popliteal region with intermittent prominent erythema

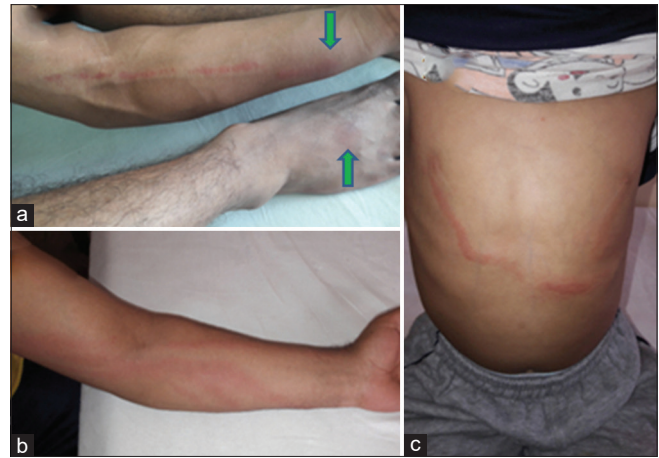
CHG - complete hemogram; CRP - C-reactive protein; RFTs - renal function tests; LFTs - liver function tests; TLC - total leukocyte count; DLC - differential leukocyte count; ESR - erythrocyte sedimentation rate

The mean/median age of these patients was 30 years (range 9–52 years). The minimum duration of development of lymphangitis was within minutes in the case of a mosquito bite reaction and around 72 hours in the case of trauma/infection induced, with a median interval of 48 hours. Upper extremity was the most commonly involved site in 8 (72%) patients, followed by trunk 2 (18%) and lower extremity 1 (9%). Arthropod bite reaction was the commonest etiological agent noticed in 7 (63%) patients, out of which unknown insect bites in 4 (36%), spider bites, mosquito bites, and probable insect bites (unnoticed insect bites) in 1, respectively. Bacterial infection was discerned in two patients (18%): tuberculin sensitivity and erythema nodosum one each. All patients presented with linear erythematous streaks extending toward draining lymph nodes; however, the length of the streaks was different for different sites and causative agents [Figures 1–3]. Lymphadenopathy was seen in 2 patients having histories of insect bite (probably secondary bacterial infection) and spider bite (toxin/bacterial infection), respectively; however, no systemic involvement was seen except for a mild elevation of the complete blood count in one patient. All but two patients were treated symptomatically for pain and pruritus with topical corticosteroids. Short-course oral corticosteroids were given to one patient with a history of insect bite and severe pain after ruling out a bacterial infection. The remaining two patients with a history of severe pain, malaise, and fever with lymphadenopathy were treated with antibiotics along with symptomatic management.

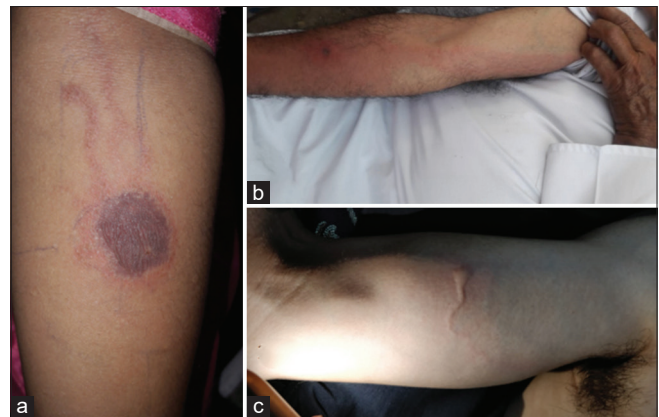
## Discussion

The lymphatic system is a network of vessels that drains the leaked tissue fluid back into the circulation. It comprises lymphatic vessels, lymphatic organs, lymph nodes, and widely scattered lymphoid tissue within the connective tissue.<sup>[2]</sup> Lymph is a colorless tissue fluid flowing through these lymphatic channels. The earliest evidence of lymphatic vessels in writing is obtained from the 4<sup>th</sup> century B.C. by Hippocrates and Aristotle. However, during the middle ages, this knowledge was largely forgotten until 1627, when Aselli described lacteal vessels. Several decades later, Jean Pecquet demonstrated cisterna chyli and thoracic duct drainage to the right subclavian vein. Thomas Bartholin later stated that lymph flows throughout the body through a network of vessels, and he named these vessels as “vasae lymphaticae,” which led to the current term “lymphatic vessels.”<sup>[3]</sup>

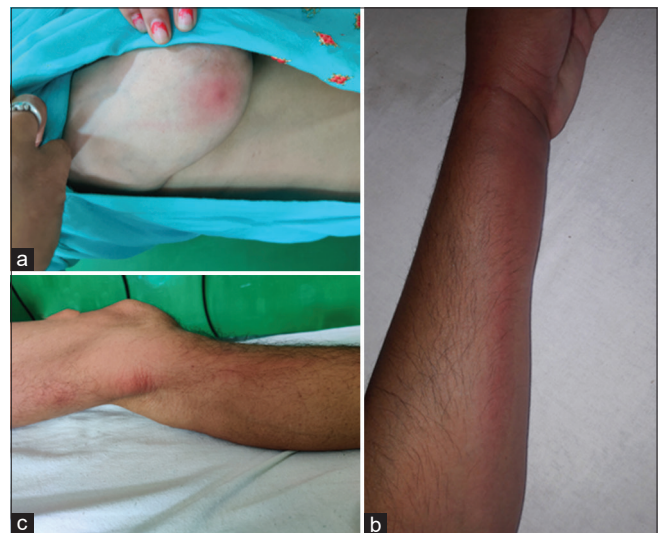
Lymph is formed in the initial lymphatics (lymphatic capillaries), which are located in close proximity to the microcirculation. They consist of a single endothelial layer with a poorly defined basement membrane. These vessels may be like saccules, blind-ended, or they may form an interconnected network or plexus. The initial lymphatics drain into collecting lymphatics, which are distinguishable



**Figure 1:** Linear lymphangitic streaks (a) in a patient with erythema nodosum nodules (arrow) over feet and distal forearm, (b) in a patient with trauma over dorsum of hand, and (c) insect bite in a child over chest with papular lesions suggestive of insect bite hypersensitivity over upper chest and abdomen



**Figure 2:** Lymphangitis over upper limbs after (a) intradermal tuberculin antigen, (b) spider bite, and (c) mosquito bite



**Figure 3:** Lymphangitis after (a) an insect bite, (b) an unknown insect bite, and (c) trivial trauma over the ankle

by the presence of a smooth muscle layer and one-way bicuspid valves to prevent retrograde fluid flow. The



lymphatic vessels are so thin that the mere presence of valves gives the lymphatic channels a beaded appearance.<sup>[2]</sup>

The prenodal collecting lymphatics (afferent lymphatics) transport lymph to the lymph nodes, exiting through postnodal collecting lymphatics (efferent lymphatics) to larger lymph trunks, the thoracic duct and right lymph duct, and emptying into the subclavian veins.

Vertebrates have a high-pressure, closed system for blood circulation, which leads to net filtration of fluid and solutes from the microvasculature to the surrounding interstitium.<sup>[4]</sup> The function of the lymphatic system is to maintain normal plasma and tissue fluid volumes by returning the excess interstitial fluid, solutes, and cells to the central circulation, thus preventing hypovolemia and the development of tissue oedema. Lymphatics also play an important role in the transport of lipids after being absorbed in the digestive tract. In addition, lymphatics are necessary for the rapid identification of antigens and immunological responses in the body.<sup>[3]</sup>

The lymphatic vessels are present in all the tissues except the bone marrow, eyeball, central nervous system, epidermis, cartilage, internal ear, teeth, cornea, and placenta.<sup>[2]</sup> Confining ourselves to the superficial cutaneous lymphatics, drainage of the head and neck region is by a jugular chain of lymph nodes adjacent to the internal jugular and ultimately into the subclavian vein.<sup>[5]</sup> The skin of the upper limbs is drained by the axillary group of lymph nodes, while the lower limbs drain into superficial inguinal nodes. The truncal region above and below the umbilicus drains into the axillary and superficial inguinal lymph nodes, respectively. Thus, a watershed line is formed horizontally, passing through the umbilicus where the lymphatic channels do not cross.<sup>[2]</sup>

Three common conditions related to the lymphatic system are lymphadenitis (inflammation of lymph nodes), lymphoedema (swelling as a result of the collection of tissue fluid due to the obliteration of lymphatic channels), and lymphangitis (inflammation of lymphatic channels). In this article, we are describing lymphangitis cases along with a literature review.

Lymphangitis is an inflammation of lymphatic channels caused by infectious or non-infectious agents. The oldest report of lymphangitis which we could find in the literature is by Richard Sick in 1949, who reported recurrent lymphangitis associated with cellulitis.<sup>[6]</sup>

The etiological factors of lymphangitis are listed in Table 2. Infections, especially acute bacterial infections such as *Staphylococcus aureus*, *Streptococcus pyogenes*, and *Pasteurella multocida* infections, are considered the most common cause of lymphangitis.<sup>[1]</sup> However, non-bacterial infections like viral, fungal, and parasitic infections are also described in the literature as etiological factors.

**Table 2: Etiological agents of lymphangitis**

Nature of Agent	Organism/agent
Bacterial	<i>Staphylococcus aureus</i> , <i>Streptococcus pyogenes</i> , and <i>Pasteurella multocida</i>
Viral	Herpes simplex, Herpes zoster
Fungal	<i>Sporothrix schenckii</i> , <i>Aspergillus</i> species
Parasitic	<i>Wuchereria bancrofti</i>
Arthropod bite	Insect bite Pigeon tick bite Spider bites <i>Loxosceles reclusa</i> (brown recluse spider) <i>Loxosceles arizonica</i> <i>Centepede bite</i>
Iatrogenic	Tuberculosis purified protein derivative test Bacillus Calmette-Guérin vaccine Topical Cantharidin therapy Bleomycin injection (intralesional)

Herpes simplex and herpes zoster are the common viral infections reported with lymphangitis. In 2019, Lieberman et al.<sup>[7]</sup> reported a case of a 10-year-old female child secondary to palmar herpetic whitlow. Fungal infections like *Sporothrix schenckii* and *Aspergillus* species are associated with nodular lymphangitis; however, there are reports of both agents presenting with acute lymphangitic streaks.<sup>[2]</sup> Among parasitic infections, *Wuchereria bancrofti* can present as acute filarial lymphangitis (AFL), occurring due to the death of adult filarial worms in the lymphatics spontaneously or following the administration of diethylcarbamazine. AFL usually presents as descending lymphangitis in contrast to prototypical ascending streaking.<sup>[8]</sup> Another association with filarial lymphangitis is acute dermatolymphangioadenitis, which presents as lymphadenitis and lymphoedema following secondary bacterial infection. There are some non-infectious causes that can lead to linear streaking, such as arthropod bites and iatrogenic. Various reports in the literature exist, demonstrating different insects, mites, ticks, spiders, and centipedes as etiological agents for lymphangitis. Sensitivity to tuberculin, Bacillus Calmette-Guérin vaccine, topical cantharidin for verrucae vulgaris, and bleomycin injection for verrucae plantaris has also been reported to cause lymphangitis.<sup>[2,9,10]</sup> In our study, four patients were having unknown insect bites: one patient each of spider bite, mosquito bite, probable insect bite, tuberculin sensitivity, and erythema nodosum, while two patients with a history of trauma were supposed to have a secondary bacterial infection.

The pathophysiology of superficial lymphangitis remains unknown, but it is thought to be due to the traversing of inflammatory cells (infections)/toxin (arthropod bite) along the lymphatic channels, causing a linear spread of the inflammation. Toxins contained in the secretion of arthropods lead to type 1 hypersensitivity reactions;

**Table 3: Summary of lymphangitis studies published after the year 2000**

Reference	Country (Year)	Publication (Author)	Age in years/Sex	Etiology (Site involved)	Title
[15]	2007 (Switzerland)	Letter (Abraham <i>et al.</i> )	62/M	Insect bite (Trunk, upper and lower limbs)	Lymphangitis due to insect sting
[16]	2008 (France)	Case series (Marque <i>et al.</i> )	60/F, 20/M, 35/M, 61/F, 16/Fch, 20/F	Insect bite (Right breast, abdomen, arms and trunk, chest, right arm, left arm, respectively)	Superficial lymphangitis after arthropod bite: a distinctive but under-recognized Entity?
[12]	2008 (France)	Case report (Cendras <i>et al.</i> )	28/F	Herpes simplex (Right upper limb)	Herpetic recurrent upper limb lymphangitis
[17]	2013 (Italy)	Insights and images (Piccolo <i>et al.</i> )	10/Fch	Insect bite (Trunk)	Superficial lymphangitis after insect bite
[10]	2017 (USA)	Case report (Essler <i>et al.</i> )	79/M	Centipede bite (Left arm)	Lymphangitis from <i>Scolopendraheros</i> envenomation
[1]	2016 (USA)	Brief report (Cohen <i>et al.</i> )	....	Herpetic whitlow (Right forearm)	Nonbacterial causes of lymphangitis with streaking
[18]	2016 (Japan)	Case report, (Mitsuhito Ota)	9/Mch	Mosquito bite (Bilateral feet)	Allergic lymphangitis
[19]	2017 (Ireland)	Images (Simma <i>et al.</i> )	7/M	Insect bite (Left upper limb)	Ascending upper limb lymphangitis
[13]	2017 (Switzerland)	Images in pediatrics, (Meyer Sauteur <i>et al.</i> )	8/Mch	Insect bite (Anterior chest)	Recurrent superficial lymphangitis after insect bites
[7]	2019 (USA)	Case report (Lieberman <i>et al.</i> )	10/F	Herpetic whitlow (Left forearm)	Palmar herpetic whitlow and forearm lymphangitis in a 10-year-old female
[20]	2019 (USA)	Letter (Ferdman <i>et al.</i> )	13/F	Mosquito bite (Bilateral forearms)	Superficial allergic lymphangitis with a cutaneous recall reaction to a mosquito bite
[21]	2020 (Slovenia)	Case report (Dimcic <i>et al.</i> )	60/F	Bacterial infection (Right hand and forearm)	Rapidly progressive infection of hand after a cat bite
[22]	2020 (Israel)	Letter (Oron <i>et al.</i> )	17/F	Bacterial infection (Right hand and forearm)	Cellulitis and lymphangitis following an injury from a broken cellular phone touch screen
[23]	2020 (Japan)	The clinical picture (Kano <i>et al.</i> )	49/M	Bacterial infection (Right forearm)	Acute lymphangitis
[24]	2021 (USA)	Original article (Kimia <i>et al.</i> )	.....	Bacterial infection (Upper and lower limbs)	Is lymphangitic streaking associated with different pathogens?
[14]	2021 (Italy)	Original article (Laghi <i>et al.</i> )	30/F	Insect bite (Trunk)	Mite bites, comet signs and possible mammary prosthesis rejection after returning to a vacation home: a diagnostic challenge
[25]	2021 (Turkey)	Case report (Kose <i>et al.</i> )	29/F	Spider bite (Left leg)	Skin necrosis, diffuse urticaria, and cellulitis due to presumed <i>Loxosceles</i> spider bite
[11]	2023 (Japan)	Case report (Kano <i>et al.</i> )	Middle aged Mch	Insect bite (Right hand and forearm)	Superficial lymphangitis after arthropod bite: a warning against unnecessary antimicrobial use

however, delayed reactions are thought to be involved in tuberculin reagent sensitization.<sup>[11]</sup>

Lymphangitic streaking is characterized by linear erythema corresponding to the inflamed vessels and extending proximally toward regional lymph nodes. Clinical features that distinguish between arthropod bite-induced versus bacterial superficial lymphangitis include the absence of pain, tenderness, fever, and lymphadenopathy, presence of

pruritus, and a self-limiting clinical course in the former. Sometimes, patients are not aware of an insect bite; however, examination shows a central punctum with surrounding erythema and similar marks over other parts of the body, suggesting the possibility of insect bite hypersensitivity.<sup>[11]</sup>

Recurrent episodes of lymphangitis are reported with recurrent herpetic whitlow in a 28-year-old female.<sup>[12]</sup> Multifocal and recurrent linear streaks are

reported secondary to arthropod bites.<sup>[13]</sup> Patients with hematological abnormalities (chronic lymphocytic leukemia) have a greater tendency to develop exaggerated responses after arthropod bites, manifesting as vesicles or bullae with prominent edema and erythema that may be accompanied by lymphadenopathy and lymphangitic streaking.<sup>[1]</sup>

The clinical morphology of lymphangitis, however, differs depending on the site involved and the causative factor. Laghi *et al.*<sup>[14]</sup> described a comet sign in mite bite-induced lymphatic streaks simulating a comet tail; we also reported various morphologies resembling comet tail, octopus, or spermatozoa-like in our patients. We searched the literature for lymphangitis associated with various etiological factors and were able to retrieve 18 articles published after the year 2000. A summary of all retrieved articles is provided in Table 3.<sup>[15-25]</sup>

Among various differentials like superficial thrombophlebitis, phytophotodermatitis, and drug-induced pigmentation, the former being the closest needs to be elaborated.<sup>[26]</sup> Superficial thrombophlebitis is an inflammatory disorder of superficial veins with coexistent venous thrombosis. It also presents as a linear, erythematous, painful lesion overlying the track of a superficial vein but with palpable tender, cord-like structure on examination. Superficial thrombophlebitis was earlier considered a benign entity; however, it is often associated with deep venous thrombosis or pulmonary embolism due to a concomitant hypercoagulable state, autoimmune disorders, or malignancy.<sup>[27]</sup> Another variant of superficial thrombophlebitis is Mondor's disease (sclerosing thrombophlebitis), a self-limiting disorder that affects the breast (thoraco-epigastric vein) and sometimes the penis (superficial penile vein), presenting with linear, asymptomatic, or tender cord-like thickening of the affected vein.<sup>[28]</sup>

Superficial lymphangitis is a self-limiting condition requiring only symptomatic treatment, especially in arthropod bite reactions; however, severe cases may require topical or systemic steroids or even antibiotics when secondarily infected. Infective (bacterial, viral, fungal, or parasitic) lymphangitis is treated according to the type of infectious agent involved.<sup>[1]</sup>

## Conclusion

Linear streaking is often considered to be a bacterial infection. However, non-bacterial infections and even non-infectious causes should be kept in mind while dealing with a patient with superficial lymphangitis to make judicious use of systemic antibiotics in the era of antimicrobial resistance. At the same time, it is imperative to differentiate superficial thrombophlebitis, which has sinister associations, from lymphangitis, a self-resolving condition.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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