A Retrospective Study of the Severe and Uncommon Variants of Erythema Nodosum Leprosum at a Tertiary Health Center in Central India

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Abstract

Background: Erythema nodosum leprosum (ENL) classically presents with tender, coppery, evanescent nodules along with constitutional features and visceral involvement. However, uncommon morphological variants of ENL-like erythema nodosum necroticans, erythema multiforme (EM)-like ENL, Sweet’s syndrome (SS)-like ENL, Lucio phenomenon, and reactive perforating type of ENL have also been described in the literature. The primary objective of this study was to describe the clinical features of the severe and uncommon morphological variants of ENL. Methods: This was an observational case series with retrospective review of records of all ENL patients with ulceronecrotic lesions admitted in the Department of Dermato-Venereo-leprology of a tertiary health center of central India over a period of 2 years. Results: Eighteen patients were included, all of whom had ulceronecrotic lesions. Four out of them had EM like ENL, two had SS-like presentation, and one of them had annular bullous lesions over old infiltrated plaques of leprosy. Conclusions: Uncommon variants of ENL can be very commonly misdiagnosed in patients, especially in those who have not been previously diagnosed with leprosy. Hence, a high index of suspicion is required in such cases to avoid delay in the diagnosis and resulting morbidity.

Keywords: Erythema multiforme-like erythema nodosum leprosum, erythema nodosum leprosum, erythema nodosum necroticans, leprosy, Sweet’s syndrome-like erythema nodosum leprosum

INTRODUCTION

In the postelimination era, renewed interest in leprosy has developed owing to the reemergence of infection not only in India but also in the Western countries.¹ Newer insights into the mode of transmission, pathogenesis, namely, increased expression of IL17A in lepromatous skin as well as newer diagnostic techniques with the use of microsatellite typing of mycobacterial strains has been obtained.²,³ However, it still continues to be a particularly devastating disease, especially in the developing and the underdeveloped world, due to the deformities and morbidities associated with it, and one of the most important factors contributing to it are leprosy reactions. Type 2 reaction or erythema nodosum leprosum (ENL) is a Type III immunological reaction characterized generally by crops of evanescent, coppery tender nodules, and plaques with the involvement of other organ systems such as the eyes, testes, nerves, liver, and kidney. ENL occurs most commonly in the lepromatous pole and can present before initiation, during or after completion of multidrug therapy (MDT). ENL can be graded as mild and severe.⁴ Severe ENL includes necrotic ENL or erythema nodosum necroticans (ENN), which is a rare presentation seen in around 8% of patients.⁵ Other uncommon and severe variants of ENL, presenting with ulceronecrotic and pustular lesions, have also been reported in the literature. This includes vesiculobullous, Sweet’s syndrome (SS)-like,⁶ erythema multiforme(EM)-like, Lucio phenomenon (LP), and reactive perforating type.⁷,⁸ Due to their atypical morphology, these variants can mimic many other conditions.

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Case reports where these atypical lesions were erroneously treated as cutaneous vasculitis, systemic-onset juvenile idiopathic arthritis, and SS have been described. This leads to diagnostic delay thus accelerating the process of nerve damage resulting in significant deformities. Therefore, having a sound knowledge of these not so common variants is important to ensure the early diagnosis and treatment. There are only a few isolated, published case reports describing these forms of ENL, but there is no study highlighting the clinical profile of these morphological variants. Hence, the present study was undertaken to analyze some of the important aspects of these severe and uncommon variants.

**Methods**

Ethical clearance was obtained before the study (vide 1620/EC/Pharmac/GMC/NGP/dated 16/10/18). Records of all ENL patients admitted to the Dermatology Inpatient Department of Government Medical College, Nagpur, from June 2016 to May 2018 were retrieved and analyzed with reference to age, sex, onset of ENL episode, number of episodes, spectrum of leprosy, morphology of lesions, severity, deformity, systemic complications, bacteriological and morphological indices, and treatment given.

The diagnosis of ENL was made based on the history, clinical examination, microbiology, and histopathology.

Chronic ENL was defined as persistence of ENL for >6 months despite adequate treatment. Recurrent ENL was defined as occurrence of >4 episodes of ENL in a year.

**Results**

A total of 81 patients were admitted in the Inpatient Dermatology Department at a tertiary health center with an episode of ENL. Out of these, 18 (21%) patients presented with ulceronecrotic lesions along with other features of severe ENL. Out of 18 patients, 9/18 (50%) were female and 9/18 (50%) were male with a male-to-female ratio of 1:1. Age ranged from 19 to 65 years with the majority, i.e., 6/18 (33%) of patients between 41 and 50 years of age [Table 1].

55% of these 18 patients with ulceronecrotic ENL presented to us after completion of MDT, 6 of them within one year of being released from treatment [Table 2].

8/18 (44%) had recurrent ENL, 2/18 (11%) had chronic ENL, and the details of these patients are enumerated [Table 3]. In 5/18 patients precipitating factor could be identified in the form of malignancy, HIV, pregnancy, TB, and cystitis.

All patients were in the lepromatous pole with 15/18 (83%) in the borderline lepromatous spectrum [Table 3]. 9/18 (50%) patients had a high bacteriological index at the time of presentation, i.e., ≥4+ [Table 3].

All 18 patients had ulceronecrotic lesions [Figure 1]. Two patients had SS like presentation of lesions characterized by multiple edematous, erythematous plaques over the trunk, face, bilateral upper limbs, and lower limbs with few lesions over arm studded with pseudo vesicles and with central pallor [Figure 2]. Histopathology revealed superficial and deep perivascular infiltrate of lymphohistiocytes with ill-defined granulomas and evidence of endothelial damage and fibrin deposition [Figure 3]. Four patients had multiple lesions all over the body in various stages of evolution consisting of erythematous papules, plaques, and target lesions resembling EM [Figure 4]. One patient had multiple annular bullous lesions containing turbid fluid over infiltrated plaques of Hansen’s disease [Figure 5]. Histopathology showed granulomas, evidence of vascular damage, and neutrophilic infiltrate [Figure 6].

| Table 1: Age distribution of study sample |
|-----------------------------------------|
| Age (years) | Number of patients |
| 11-20 | 3 |
| 21-30 | 4 |
| 31-40 | 3 |
| 41-50 | 6 |
| 51-60 | 1 |
| >60 | 1 |
| Total | 18 |

| Table 2: Patient distribution on the basis of onset of ulceronecrotic episode |
|---------------------------------|
| Onset | Number of patients |
| After MB-MDT (years) | 6 |
| Within 1 | 2 |
| 1-2 | 2 |
| After 2 | 2 |
| During MB-MDT (months) | |
| First 6 | 5 |
| Next 6 | 2 |
| Before starting MB-MDT | 1 |

MB-MDT: Multibacillary-multidrug therapy.

Figure 1: (a-c) Ulceronecrotic lesions. (d) Claw hand in a patient of erythema necroticans.
All 18 patients had either moderate-to-severe neuritis with the involvement of >1 nerve. Nearly 8/18 (42%) patients had Grade 1 deformity, and 6/18 (33%) patients had Grade 2 deformity. All patients had associated low-grade fever to high-grade fever and significant tender lymphadenopathy involving the inguinal and cervical lymph nodes were seen in 16/18 (84%) patients. Other features seen were arthralgia in ten patients, tibial tenderness in four patients, peripheral edema in three patients, and iritis in one patient.

All the patients were started on oral prednisolone according to the WHO guidelines. In addition, thalidomide was used in six patients, and azathioprine was used in three patients. Multibacillary-MDT (MB-MDT) was initiated/restarted whenever required. ENL episode was controlled in all patients within 2–3 weeks after the treatment was initiated.

**Discussion**

ENL is an immune complex reaction causing fever, malaise, and inflammation of the skin, nerves, and other organs. There is sudden appearance of crops of evanescent, pink rose colored, blanchable, tender papules, nodules, and plaques which are variable in size. ENL can be differentiated into mild and severe. The presence of ulceration or skin necrosis along with constitutional and systemic manifestations is indicative of severe ENL. Severe ENL can also manifest as recurrent or chronic episodes, not responding promptly to conventional therapy.

The known risk factors for ENL are lepromatous pole, ≥4+, patients <40 years, intercurrent infections, pregnancy, stress, etc. Majority of the patients in this study were in the third–fifth decades of life. Relatively lower incidence was seen in both extremes of age. There was no sexual predilection. All the patients belonged to the borderline lepromatous or lepromatous pole with the majority having a high bacteriologic index (BI) at presentation irrespective of the treatment taken. Other possible aggravating factors that we identified in this study were HIV, tuberculosis, pregnancy, malignancy, and cystitis.
Table 3: Clinical profile of study sample

| n  | Age/sex     | Onset            | MI  | BI  | Spectrum       | Number of episodes | Precipitating | Diagnosis        |
|----|-------------|------------------|-----|-----|----------------|-------------------|---------------|------------------|
| 1  | 40/female   | 3 months RFT     | 30% | 4   | BL             | Recurrent ENL     |               | SS like ENL      |
| 2  | 30/female   | On a 3rd packet of MB-MDT | 10% | 5   | BL             | Recurrent ENL     |               | ENN              |
| 3  | 22/female   | 6 months RFT     |     | 4   | BL             | Recurrent ENL     | Pregnancy      | ENN              |
| 4  | 26/male     | On a 3rd packet of MB-MDT |     | 3   | BL             | Recurrent ENL     |               | ENN              |
| 5  | 19/female   | On a 3rd packet of MB-MDT | 30% | 6   | LL             | First episode of ENL | HIV           | ENN              |
| 6  | 18/male     | 1-year RFT       |     | 0   | BL             | First episode of ENL |               | EM like ENL      |
| 7  | 65/male     | De novo ENL      | 20% | 4   | LL             | First episode of ENL |               | ENN              |
| 8  | 51/female   | After 2 years of MB-MDT |     | 0   | BL             | Recurrent ENL     | Malignancy     | SS like ENL      |
| 9  | 31/male     | On a 7th packet of MB-MDT |     | 4   | BL             | Chronic ENL       |               | ENN              |
| 10 | 29/male     | 2 years RFT      |     | 1   | BL             |                   |               | ENN              |
| 11 | 36/male     | 1-year RFT       |     | 2   | BL             | First episode of ENL |               | ENN              |
| 12 | 20/male     | On a 7th packet of MB-MDT |     | 2   | BL             | Recurrent ENL     | Cystitis       | ENN              |
| 13 | 45/male     | On a 3rd packet of MB-MDT |     | 4   | BL             | Recurrent ENL     | EM like ENL    |
| 14 | 50/female   | On a 2nd packet of MB-MDT |     | 2   | BL             | First episode of ENL | Anaenolysis    |
| 15 | 50/male     | RFT for 6 months |     | 4   | LL             | Recurrent ENL     |               | ENN              |
| 16 | 45/female   | RFT for 6 months | 10% | 4   | BL             | Chronic ENL       | HIV, TB        | ENL              |
| 17 | 44/male     | RFT for 3 years  | 10% | 3   | BL             | Recurrent ENL     |               | ENN              |
| 18 | 45/male     | RFT for 10 years |     | 4   | BL             | Recurrent ENL     |               | ENL              |

MB-MDT: Multibacillary-multidrug therapy, BI: Bacteriologic index, MI: Morphological index, ENL: Erythema nodosum leprosum, SS: Sweet’s syndrome, ENN: Erythema nodosum necroticans, EM: Erythema multiforme, RFT: Released from treatment

Figure 6: Ill-defined granulomas, evidence of endothelial damage, and neutrophilic infiltrate in the dermis (H and E, ×10)

Constitutional features such as fever and arthralgia along with peripheral lymphadenopathy were seen in all patients. Moderate-to-severe neuritis was demonstrated in 100% of patients, and 89% of them had either Grade 1 or Grade 2 deformity.

ENN is characterized by the vesicular, bullous, or pustular lesions which become necrotic and break down to produce ulcers. It was first reported by Verma and Pandhi in 1993. All published case reports of ENN have the common finding of disabling constitutional and systemic manifestations associated with the episode, which was also seen in all of our patients. The closest differential diagnosis of ENN is LP. We can differentiate between them by the absence of constitutional symptoms, visceral damage, or neuritis in LP. LP is characterized by diffuse infiltration and the presence of triangular or angular superficial ulcers that heal with atrophic and hypochromic scars. ENN heal with fibrotic, hypertrophic, or radiating scars. On histopathology, LP shows endothelial cell colonization by acid-fast bacilli, necrotizing vasculitis of the small dermal vessels of the superficial epidermis, and proliferation of endothelial cells in the medium-sized vessels of the mid dermis, whereas ENN is characterized by pan vasculitis starting in the hypodermis.

SS-like ENL was first described by Kuo and Chan in 1987. Since then, a few similar cases have been reported. Chiaratti et al. described a leprosy patient with history of asthma who had intermittent erythematos lesions with pseudovesicular component, which improved with the use of oral corticosteroids for asthma attacks. Chronicity and disseminated skin lesions indicated histopathological analysis, which ultimately confirmed the diagnosis. Histopathological features of SS-like ENL are dense neutrophilic infiltrate in the papillary dermis concomitantly with pronounced edema, unlike in classical ENL, where the infiltrate is more pronounced in the reticular dermis, dermo-hypodermic junction, and subcutaneous tissue. Identification of foamy histiocytes amidst the infiltrate on Fite-Faraco staining is confirmative. Vijendran et al. and Heng YK et al. reported two cases of patients presenting with de novo ENL simulating SS without any preceding history of leprosy, and in both cases, histopathology clinched the diagnosis. Aires et al. reported seven cases of SS-like ENL, four out of whom were already diagnosed leprosy patients, like in our case, where diagnosing this variant was quite easy. Difficulty arises in cases without any known history of leprosy, in which case, careful evaluation of a biopsy specimen with Fite-Faraco staining is
necessary to confirm the diagnosis.\[17\] Furthermore, response to corticosteroids used conventionally in SS can further result in a delay in the diagnosis.

Bullous reactions in leprosy are a manifestation of severe ENL in patients with a very high bacillary index. Sethuraman et al. in 2002 reported a 35-year-old male patient with bullous ENL whose skin biopsy revealed subepidermal bulla with neutrophils and macrophage granuloma in the dermis together with a perivascular neutrophilic infiltrate.\[18\] These lesions can often be confused with fixed-drug eruption, pemphigus vulgaris, bullous pemphigoid, and other blistering diseases. Sparing of oral mucosa, the presence of classical ENL lesions along with the bullous lesions, the absence of acantholytic cells on Tzanck smear, and immunofluorescence can clinch the diagnosis.\[19\] In this study, one patient had annular bullous lesions over old infiltrated plaques of Hansen’s disease. In 2009, Kar et al. described similar lesions in a patient of borderline lepromatous spectrum who was treated with ofloxacin.\[20\] These lesions can be confused with Type 1 reaction, but our patient had classical ENL lesions on the trunk and lower limbs, and histopathology was suggestive of ENL.

Nearly 4.5% of ENL patients are estimated to have EM-like morphology.\[21\] We found such lesions in three of our patients. Miranda et al. studied 27 patients over a 10-year period who presented with EM-like ENL. Eight out of them had EM-like ENL as the first manifestation of leprosy, 11 patients presented during therapy with MB-MDT, and the remaining after therapy. Only nine patients presented with concomitant classical ENL lesions such as papules, nodules, and ulcers during the episode studied, as seen in our patients. In the remaining patients, leprosy was confirmed by the demonstration of lepra bacilli on histopathology. The absence of palmoplantar and mucosal lesions and a low incidence of apoptotic cells are seen in leprosy reactions unlike classical EM. Till date, literature does not report MDT drugs associated with the initiation of EM; however, the possibility of the same due to some other self-administered drugs by the patient cannot be excluded.\[21\]

Like classical ENL, ulceronecrotic ENL can present de novo, during MB-MDT or after the completion of MB-MDT. 55% (10/18) of our patients presented to us after completion of 12 months of MB-MDT. Our results are corroborated by a study on ENL by Dogra et al. where 39.2% of patients presented with ENL after 2 years of initiation of treatment.\[22\] 6 of these 10 patients who presented after treatment completion had either recurrent or chronic ENL. When the bacteriological indices were repeated in these six patients, all patients revealed a BI≥24, and three patients had a positive morphological index indicating disease activity. MB-MDT was reinstituted wherever required. All these patients had been treated and released from treatment from the primary health-care hospitals, and we could not find any record of their previous indices or adequacy of treatment.

The declining utility of SSS in the WHO guidelines has led to the abandoning of this investigation in leprosy control programs. However, with a specificity of 100% and sensitivity ranging from 10% to 50%, it can be a useful diagnostic as well as monitoring tool, to prevent premature termination of treatment in patients with high bacillary load, in whom extended MDT is desirable. As leprosy programs have been integrated with general health-care services, it is important to train the peripheral workers and program managers in this basic bedside investigation and encourage them to coordinate with referral centers maintaining specialized services in dermatology.\[23\]

About 55% of our patients had recurrent or chronic ENL before developing the episode of severe ulceronecrotic ENL, and all of them were on steroids for long durations of time with partial or complete relief, but always with severe relapses. The WHO recommended regime for severe ENL includes oral prednisolone given up to duration of 24 weeks along with clofazimine. However, in practice, this seems to be an oversimplification of the management of such a complex disease and found to be ineffective in a major proportion of patients.\[24\] Many studies have been conducted and many agents such as azathioprine, methotrexate, thalidomide, and minocycline have been used in ENL with good results reducing the dependency on steroids. Thus new treatment protocols should be devised keeping in mind the present needs. Managing these severe ENL cases is a challenge even for the experienced dermatologist. If not properly trained, the peripheral health worker might not be experienced enough to identify and manage these patients. Therefore, specific and strict guidelines should be drawn up for the health workers as to when to refer these cases to a higher center for specialized care.

In this study, 2/10 patients who came with recurrent ENL episodes, 3 and 10 years respectively, after completion of treatment had BI≥3 and positive MI and were classified as relapse cases based on Becx–Bleumink criteria. Dogra et al. reported a relapse rate of 1.7% during a surveillance period of up to 10 years.\[22\] In 2016, India reported 536 cases of leprosy relapse, a slight increase over the 459 reported in 2015. Relapses occur due to poor patient compliance, but it can also be the result of drug resistance. Therefore, a long-term surveillance of all treated cases is of utmost importance as well as expansion of the repertoire of anti-leprosy drugs with standardized protocols for drug-resistant cases.\[24,25\]

The appearance of severe forms of lepromatous leprosy and reaction patterns across India has mandated the need to review the current guidelines of “fixed duration therapy” for all types of MB leprosy. Comorbidities such as tuberculosis, HIV, pregnancy, and malignancy can affect clinical manifestations and complications; hence, novel therapeutic management strategies needs to be devised, tailored to such specific situations.\[26\] Another area to ponder upon is the discovery of new species of lepra bacilli, for example, Mycobacterium lepromatis reported by Han et al. in 2008 which could result in the more persistent, uncommon, and severe clinical picture.\[27\] However, more research work needs to be carried out to address
these issues; and India having the highest prevalence of leprosy provides the most ideal setup for it.

**Conclusions**

In the current scenario, treatment of lepra reactions is a major problem further complicated by its varied and atypical presentations. A thorough literature search revealed only isolated case reports. No large-scale study had been conducted till date highlighting the clinical profile of these variants. It is recommended that physicians make themselves aware of these variants as failure to diagnose and treat them adequately can increases the morbidity and mortality associated with leprosy. Unjustifiable use of steroids in all leprosy patients for long durations, failure to follow-up patients, and track defaulters are serious issues that need to be addressed. The failure to upgrade the scientific infrastructure, lack of research in the field of leprosy has created obstacles in the path to developing new treatment options and protocols. Only if we can ameliorate these factors, can we hope to have leprosy-free world.

**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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**Conflicts of interest**

There are no conflicts of interest.

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