Evaluation of Roger’s Charcot Foot Classification System in South Indian Diabetic Subjects with Charcot Foot

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Abstract:

Background and aim: The Roger’s classification of Charcot foot, which is a two-axis system, describes the location of the affected part (x-axis) and the severity (y-axis). The aim was to evaluate this system in terms of the risk of lower extremity amputation among South Indian patients with type 2 diabetes and Charcot foot.

Research design and methods: Fifty-three subjects with Charcot foot were included. Classification and grading of Charcot foot was done using Eichenholtz and Frykberg systems. Details on risk factors and level of amputations were recorded.

Results: Five amputations were observed; two with deformity and ulceration in midfoot underwent below knee amputation and three with rearfoot deformity and osteomyelitis underwent above knee amputation. Risk of amputation was significantly higher in association with location and complexitystage of Charcot neuroarthritis.

Conclusion: The risk of amputation increases with increasing severity and location of the deformity, as per Roger’s Charcot foot classification system.

Key words: Charcot foot, Classification, Type 2 diabetes, India.

Introduction

Diabetic foot complications are the most common cause of non-traumatic lower extremity amputations worldwide. The risk of lower extremity amputation is 15 to 46 times higher in people with diabetes than in those who do not have diabetes. Charcot neuroarthropathy is a serious foot complication of diabetes that can frequently lead to foot ulceration, gangrene, hospital admission, and foot amputation. Jean-Martin Charcot first described it in 1868 and hence the condition was named after him. Although 30 to 50% of patients with diabetes have neuropathy, only 0.2 to 2.5% will develop Charcot neuroarthropathy. Men and women are equally affected by the condition, and it can also occur bilaterally in about 30% of the cases.

Numerous classification systems exist for the categorization of the Charcot foot according to the severity/location and complexity of the condition. The earlier classification systems were based on the radiographic findings or anatomic location. The most widely used classification is the Eichenholtz classification system. Sanders and Frykberg classified Charcot neuroarthropathy anatomically into patterns of joint involvement. These classifications are useful in staging or describing the location of the joint involvement.
The Roger’s classification of Charcot foot proposed by Lee C. Rogers is yet another scheme that describes the severity and location of the condition in a two-axis system. In this scheme the x-axis marks the location of the affected part including the forefoot, midfoot and rearfoot/ankle; and the y-axis describes the severity of the Charcot foot condition, which has four stages: Stage A is acute Charcot foot with no deformity, Stage B is Charcot foot with deformity, Stage C is Charcot foot with deformity and ulceration, and Stage D includes Charcot foot with osteomyelitis (Figure 1). Thus, it is clear from this scheme that as we move across the x-axis or down the y-axis, the risk for severity, and ultimately amputation, is high for a patient with diabetes. In the present study, we evaluated the Roger’s classification system in terms of risk of lower extremity amputation among South Indian patients with type 2 diabetes and Charcot foot.

Subjects and methods

Fifty-three (M:F 27:26) subjects with type 2 diabetes and Charcot foot (with or without deformity, ulceration and osteomyelitis) attending a diabetes specialty centre during 2003–2010 were included in this study. Age, duration of diabetes, and HbA1c details were recorded for all of the patients. Clinical parameters such as sensory neuropathy, peripheral vascular disease and infection were also assessed. Clinical diagnosis of Charcot foot was based on the appearance of a red, swollen edematous and possibly painful foot in the absence of infection. Classification and grading of Charcot foot in the patients was done using the Eichenholtz and Sanders/Frykberg Charcot foot classification systems. Details on risk factors and level of amputations were also recorded. Proportions are reported and the trend chi-square test was used to test the significance.

Results

The mean age of the subjects was 55.2±11.2 years with a mean duration of diabetes of 13.8±7.2 years. The mean HbA1c levels among the total study subjects were 8.8±2.5%.

The risk of lower extremity amputation was significantly higher in association with the location (x-axis) (trend $\chi^2 = 9.45; P = 0.009$) and the complexity/stage (y-axis) (trend $\chi^2 = 12.9; P = 0.006$) of Charcot neuroarthropathy among the study subjects. A total of five amputations were observed among the study subjects. Two patients with deformity and ulceration in the midfoot underwent below knee amputation and three patients with rearfoot deformity and osteomyelitis underwent above knee amputation. There were no amputations reported in patients with Charcot foot with or without deformity alone (Figure 2).
Discussion and conclusion

Most of the classification systems of Charcot foot include radiographic and anatomical findings; however, Roger’s classification is based on the stage/complexity and location of the Charcot foot deformity, which offers a more prognostic view of the condition. In addition, no other classification system depicts the risk factors for amputation with increasing severity and location of Charcot foot deformity. Few studies have shown osteomyelitis to be a major risk factor for lower extremity amputation in high-risk diabetic patients\(^{10,11}\). In the present study, it was observed that patients with type 2 diabetes with Charcot foot in the presence of deformity and ulceration, and those with Charcot foot in the presence of osteomyelitis are at a high risk for lower extremity amputation. In addition, the location of Charcot foot deformity in the midfoot and rearfoot increases the chances of amputation. Thus, the increasing severity and location of Charcot foot deformity increases the risk of lower extremity amputation among South Indian patients with type 2 diabetes, as per Roger’s Charcot foot classification system.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Location</th>
<th>Forefoot</th>
<th>Midfoot</th>
<th>Rearfoot</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Acute Charcot without deformity</td>
<td>8(15.0)</td>
<td>11(20.7)</td>
<td>2(3.8)</td>
</tr>
<tr>
<td></td>
<td>No. of amputations</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>Charcot with deformity</td>
<td>2(3.8)</td>
<td>7(13.2)</td>
<td>2(3.8)</td>
</tr>
<tr>
<td></td>
<td>No. of amputations</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>Charcot with deformity and ulceration</td>
<td>8(15.0)</td>
<td>5(9.4)</td>
<td>1(1.9)</td>
</tr>
<tr>
<td></td>
<td>No. of amputations</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>Charcot with osteomyelitis</td>
<td>1(1.9)</td>
<td>3(5.6)</td>
<td>3(5.6)</td>
</tr>
<tr>
<td></td>
<td>No. of amputations</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Total No. of amputations | 2 | 3

Figure 2 - Details of Charcot foot and amputation among the study subjects by location and stage [Values are n(%)]

Conflict of interest: None of the authors declared conflict of interest.

Authors’ Contributions

Dr. Vijay Viswanathan designed the study and reviewed the manuscript. Dr. Rajesh Kesavan contributed to discussion and reviewed the manuscript. Dr. Kavitha KV researched the data. Dr. Satyavani Kumpatla wrote the manuscript, contributed to discussion and reviewed the manuscript.

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REFERENCES


