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## Correlation between anesthesia, high pressure points, and ulcers of the feet of leprosy patients

Richard A. Hirschler  
*University of Nebraska Medical Center*

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CORRELATION BETWEEN ANESTHESIA, HIGH PRESSURE POINTS,  
AND ULCERS OF THE FEET OF LEPROSY PATIENTS

by

Richard A. Hirschler

A THESIS

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The College of Medicine in the University of Nebraska  
In Partial Fulfillment of Requirements  
For the Degree of Doctor of Medicine

Under the Supervision of Mary Jo Henn, M.D.

Omaha, Nebraska

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CORRELATION BETWEEN ANESTHESIA, HIGH PRESSURE POINTS,  
AND ULCERS ON THE FEET OF LEPROSY PATIENTS

Introduction

Leprosy is a chronic granulomatous infection of man. In its various clinical forms, it attacks superficial tissues including skin, mucous membranes, and peripheral nerves.<sup>6</sup>

Since Mycobacterium leprae attacks peripheral nerves, the feet often lose most or all of their feeling. At the same time, there may be abnormalities of the feet as a result of paresis of muscles, contractures and previous destruction of parts of the foot.

Extent of Disease

There are several million lepers in the world. Many leprosy patients can live nearly normal lives with a minimum of medical care. Others have severe reactions, deformities, and infections which require intensive medical care and surgery. Most leprosy patients have few financial resources and must work to eke out a livelihood. For these patients an economical and efficient way to decrease the incidence of foot problems is important.

According to Cochrane and Davey<sup>3</sup> nerve involvement resulting in anesthesia and trauma are almost the whole cause of gross damage and mutilation seen in leprosy. Excessive use, accidental trauma, burns, and other injuries often are unrecognized and can lead to severe damage especially when infection is not controlled. Proper foot wear and the cooperation of patients in regular examination of their feet for

any lesion is of utmost importance. There are some places where special footwear is made for leprosy patients. It is made to protect their feet from external injury as well as any excessive wear, especially over bony prominences where there is greater than average pressure. Increased pressure over bony prominences may cause blisters and ulcers externally from the trauma of walking if there is no protection, but they may also cause tissue breakdown internally which then develop into draining sinuses. Therefore routine inspection of anesthetic feet must be done very carefully to recognize either internal or external lesions early.

#### Procedure

This is a study of 600 feet of leprosy patients in Sierra Leone, West Africa. Sixty-nine patients were attending the clinic at the Hatfield-Archer Hospital, Rotifunk, and the others were patients at the Masanga Leprosy Hospital, Masanga.

A rubber foot print pad which is distributed by Down Brothers of Toronto was used. It has rubber ridges which form squares at multiple levels so that the deeper a sheet of paper is pressed into the pad, the more rubber ridges it will contact. A walking foot print is made by rolling printers ink onto the rubber ridges, placing a clean sheet of paper over the pad, and finally having the patient walk across the pad, placing one foot directly on the paper.

The bottom of the patient's feet were checked for anesthesia by having the patient close his eyes and point with

one finger to the place where he had just been touched with a tongue blade. Each patient was first tested by touching his arm or leg with the tongue blade until he clearly understood the procedure. Then his feet were tested.

With the foot print made, it was convenient to draw the pattern of anesthesia as well as areas of ulceration directly onto the foot print. From these records the analysis was made.

The bottom of the foot was divided into areas for analysis since often only a part of the foot was involved in the abnormality. The ten areas were: 1. the big toe; 2. the second toe; 3. the third toe; 4. the fourth toe; 5. the little toe; 6. the head of the first metatarsal; 7. the heads of the second through the fifth metatarsal; 8. the lateral border of the foot; 9. the medial arch of the foot; 10. the heel. Some areas were not present on the more deformed feet, hence there were 600 heels but only 525 little toes studied. If there was less than one half of the part present it was counted as absent.

#### Findings and Analysis

The total sum of areas studied was 5751. There were 1995 normal areas with no anesthesia, high pressure points, or ulcers. The total number with anesthesia was 3648, with high pressure points, 610, and with ulcers, 289.

Anesthesia was the most common finding with 3648 areas being anesthetic as compared to 2103 not anesthetic. Of those with anesthesia, 3372 did not have ulceration compared

with 276 with ulceration. This reveals a high number of anesthetic areas with ulceration of eight percent of these areas.

The total number of high pressure points was 610. Of these, 414 had no ulcers and 196 or thirty-two percent had ulcers associated with them.

There were 289 ulcers of which twelve or four percent were not associated with either anesthesia or high pressure points. Only one ulcer was associated with a high pressure point and no anesthesia. Anesthesia was associated with ninety-six percent, 276 of the 289 ulcers.

Anesthesia and high pressure points were associated in 504 areas of which 195 or thirty-nine percent were also associated with ulceration. Of the 289 ulcers, 195 or sixty-seven percent were associated with anesthesia and high pressure points.

There were a very large number of areas with anesthesia among those studied, so that even though only a small percentage of those with anesthesia had ulcers, nearly all of those with ulcers had anesthesia. Although there was only one ulcer associated with a high pressure point and no anesthesia, two-thirds of all of the ulcers were associated with both anesthesia and high pressure points. At the same time only nine percent of those studied had anesthesia and high pressure point combination.

The author would like to emphasize that patients with anesthesia of the foot along with high pressure points

account for a disproportionately large proportion of ulcer problems. For the patients studied, anesthesia alone is also very definitely associated with increased problems of foot ulceration.

#### Comments

The findings of this study show that there were many feet that appeared to be normal which were totally anesthetic. Absence of a part was nearly always surrounded by areas of anesthesia and was usually the result of ulceration and destruction. Anesthesia and deformities are at times associated with more severe disease or reactions which lower their resistance to infection. However, in general, there was little difference between the general health of the patients with ulcers and those without ulcers.

The findings of an increased incidence of anesthesia with ulceration and the very high correlation substantiate the recommendation that patients with anesthesia of the feet should be watched carefully for any signs of ulceration and should be protected from injury especially if a high pressure point is also present.

#### Summary

Among the several important problems facing many leprosy patients is the problem of injury and ulceration of the foot. The study of 600 feet of leprosy patients showed that there was a low percentage of ulcers in areas that were not anesthetic. Nearly all of the ulcers were in areas of the feet



that were anesthetic. Although less than one-tenth of the areas had both anesthesia and high pressure points, greater than two-thirds of the ulcers found were in areas with both anesthesia and high pressure points.

The findings of this study give support to those who advocate the use of special footwear for leprosy patients with anesthesia of the feet and especially for those with anesthesia and high pressure points.

TABLE

	1	2	3	4	5	6	7	8	9	10	T
N	154	172	172	180	184	198	181	235	252	267	1995
A	280	321	351	350	333	299	221	301	329	268	3053
P	41	6	6	5	1	11	22	4	3	6	105
U	6	1	1	0	0	0	0	1	0	3	12
AP	52	41	28	8	1	48	89	16	6	20	309
AU	16	11	3	4	5	15	12	6	0	9	81
PU	0	0	0	0	0	0	1	0	0	0	1
APU	19	4	2	1	1	26	70	36	9	27	195
T	568	556	563	548	525	597	596	599	599	600	5751

1--big toe  
 2--second toe  
 3--third toe  
 4--fourth toe  
 5--fifth toe  
 6--head of the first metatarsal  
 7--heads of the second to the fifth metatarsals  
 8--lateral boarder of the foot  
 9--arch of the foot  
 10--heel

T--total  
 N--normal  
 A--only anesthetic area  
 P--only high pressure point  
 U--only ulcer  
 AP--only anesthetic area and high pressure point  
 AU--only anesthetic and ulcer  
 PU--only high pressure and ulcer  
 APU--anesthetic area, high pressure point, and ulcer