

# The Fate of the Second Leg in the Diabetic Amputee

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About 100 years ago, Marchal de Calvi<sup>1</sup> wrote in his first treatise on diabetic gangrene: "Often the opposite leg is affected, gangrene sets in and soon again the patient succumbs to horrible suffering. Having relieved him only of his local affliction (by amputation), I have done nothing but mutilate him." The vast newer literature on lesions of the legs and feet in diabetes testifies to their continued high incidence, seriousness and poor prognosis, but rarely refers to the bilateral lesions.<sup>2-5</sup> Yet, the fate of the second leg is intimately related to that of the first leg. Ulcers and gangrene of feet or toes, though precipitated by trauma or other exogenous factors, result from systemic vascular and nervous diseases complicating diabetes. When unilateral lesions call for medical attention, one may well expect involvement of the second leg even though it may appear asymptomatic. The fate of the second leg may reflect the further natural course of the disease; it may be modified by the treatment awarded to the unilateral lesions; and it may deserve serious consideration in deciding on such treatment plan. Evidently there is need for information on this aspect of the complications of diabetes.

As part of a study on peripheral vascular disease in diabetes, we have attempted therefore to assess the integrity or impairment of the second leg in those patients who were admitted to the Jewish Chronic Disease Hospital with unilateral leg lesions or amputations. The study is still in progress, yet a preliminary report on the findings in a first group of admissions during an eighteen-month period appears to be warranted.

## OBSERVATIONS

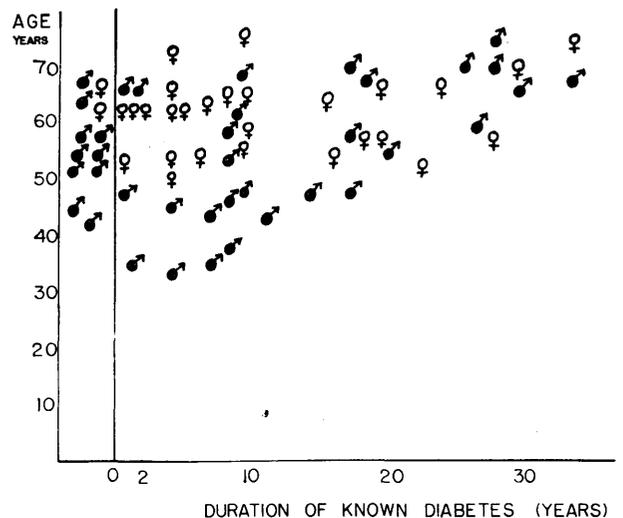
There were seventy-one patients. Their age, sex distribution and the time of the development of the first leg lesion in relation to the duration of their diabetes

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are shown in figure 1, which demonstrates the following:

The sexes were represented almost equally: thirty-nine males and thirty-two females. There was a difference



of the disease which without this complication may often remain indefinitely undiagnosed."

The histories of these seventy-one patients with leg lesions showed rather interesting data with regard to management of diabetes and its complications. These are illustrated in table 1. Twenty patients had followed no regimen at all; thirteen followed dietary restrictions only; twenty-six were under insulin treatment, and twelve were for some time during the past three years under treatment with oral hypoglycemic agents, particularly tolbutamide. Control of diabetes was poor in thirty-three patients, and could be described as fair in thirty-eight. We considered the control as fair if the urinalyses were reported as negative, or only occasionally 1+ or 2+ positive, and if the fasting blood sugar was at no time higher than 150 mg./100 ml. General well-being of the patients and their weight equilibrium were used as additional criteria where the information on blood and urine examinations was inadequate. Patients with frequent bouts of severe glycosuria, with fasting blood sugar levels above 150 mg./100 ml., or those who reported great fluctuations in their weight and their well-being, were considered as poorly controlled. There was no instance of diabetic coma, but as might be expected, there was a large number of other complications, such as neuropathy, nephropathy and retinopathy. An analysis and correlation of these complications to the diabetes and the leg lesions will be presented in another context.

TABLE 1

The diabetic history of seventy-one patients with unilateral leg lesions and subsequent involvement of the other leg

Onset	
Growth	0
Maturity	71
Management	
Free	20
Diet	13
Insulin and diet	26
Oral agents and diet	12
Control	
Fair	38
Poor	33
Complications	
Acidosis, coma	0
Retinitis	58
Nephropathy	26
Neuropathy	45

Of the seventy-one patients, forty-one had previously undergone unilateral amputations; thirty had been treated conservatively. In thirty-six of the unilateral amputees the new lesion involved the other leg; in five the other leg appeared intact, but the amputation stump

was involved. Of the thirty patients without previous amputations, nine showed lesions of both legs at the time of admission, and two developed ulcerations of the other leg while under treatment for the contralateral lesion. Thus, forty-seven patients of a group of seventy-one consecutive admissions with diabetic gangrene or amputation of one lower extremity showed involvement of the other leg. The new lesions were ulcers or gangrene of the forefoot in twenty-three cases; of forefoot and heel in seventeen, of heel alone in four and of the lateral aspect of the foot in three. Twenty-six cases showed involvement of bone by osteomyelitis. Of the remaining twenty-four cases without visible involvement of the second leg, sixteen were entirely asymptomatic, and ten stated on questioning that they noticed coldness and weakness of the remaining leg (table 2).

The interval since the first leg lesion is shown in figure 2. Eleven patients had developed the lesion of the second leg within one year; in two the second lesion developed while under treatment for the contralateral lesion; eighteen within two years; five within three years; six within four; three within five; and four after

TABLE 2

The fate of the other leg in seventy-one diabetic patients with previous unilateral leg lesions

No symptoms	14
Symptomatic	57
Without visible lesions	10
Involvement of forefoot	23
Involvement of forefoot and heel	17
Involvement of heel	4
Lateral aspect of foot	3
Complicated by osteomyelitis	26

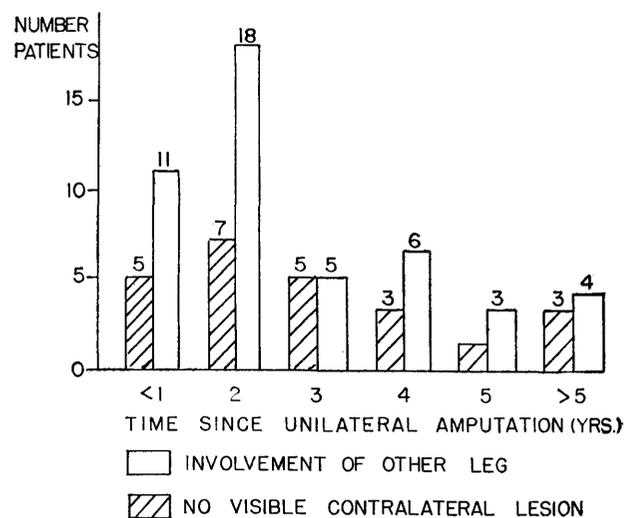


FIGURE 2

more than five years. Thus, in 50 per cent of the patients, the lesions of the second leg had developed within two years after the involvement of the first leg. This figure would probably be still higher if one considers that thirteen patients without visible lesions of the second leg had experienced their first leg lesion within the recent past, a period shorter than two years. Only three patients had preserved an apparently intact second leg for more than five years. Even in the second leg without visible lesions and without significant symptoms, circulatory impairment was found without exception by oscillometric examinations.

The generalized vascular involvement in the diabetic patients with lesions of the leg is well known by the frequent occurrence of vascular disease in other areas of the body, as retinopathy, nephropathy and cerebral arteriosclerosis with cerebral vascular accidents. An attempt was made to evaluate the functional reactivity of the vessels of the fingers and the hand, areas which show clinical involvement only rarely. Twenty patients were examined by the method of Sigroth.<sup>7</sup> The foot was immersed in warm water and the response of the skin temperature of the fingers of both hands was recorded. Normally, there occurs after a period of latency a rapid rise of the skin temperature of the fingers which reaches a maximum of 35° C. within thirty-five to forty minutes. In all our patients, a decreased reactivity was found which manifested itself both in a prolonged period of latency and an inability to attain end temperatures of more than 32° C. This finding is in line with the plethysmographic studies of the fingertips by Megibow and others<sup>8</sup> and with the studies of the arterial pulse wave of Lax and others.<sup>9</sup> In spite of the rarity of symptomatic lesions of the hands or other areas, we encountered in five patients the "stiff and pale hands" of the diabetic to which Lundbaek<sup>10</sup> has called attention, twice associated with Dupuytren-like contractures of the palmar fascia, and once with gangrene of the scrotum, probably traumatically induced by an indwelling catheter. This lesion healed under conservative therapy with vasodilator and antibiotic medication.

The ultimate fate of the second leg in our patients was far from satisfactory (table 3). Only fifteen of the forty-seven patients responded to conservative management. Amputations of the second leg became necessary in thirty-two. In fourteen patients only part of the foot needed to be sacrificed, so that they retained their leg, though impaired; eighteen became double amputees. All of these patients had been under medical supervision, at least since their first leg lesions; they had been instructed in proper hygiene and advised in diabetic

TABLE 3

The ultimate fate of the second leg (forty-seven cases)

Conservative treatment	15
Amputation	32
Above knee	10
Below knee	8
Resection of toes or forefoot	14

management; they had been treated with various vasodilator drugs by the oral, intravenous and intra-arterial route; some had undergone sympathectomy; and most had been fitted with modern prostheses and had taken advantage of the modalities of physical medicine and rehabilitation. Yet, their vascular complication progressed to bilateral leg involvement, and all too often to the loss of the second leg. In this group of patients with maturity onset diabetes, no definitive correlation was apparent between the progression of the vascular complication and the duration or degree of severity or control of the diabetes itself. This observation calls vivid attention to the great need for better means and new approaches to the management of the vascular lesions of diabetes, and for better understanding of their etiology. One hundred years ago, the question was raised by Marchal de Calvi, to quote him again: "Is it not possible that the stressful life of our times, with its struggle, aggression and anxiety which overtax all our emotional strength, has contributed to the greater frequency of certain diseases, among them diabetes and its complications?" Today we are still searching for a conclusive answer, which may enable us to find a way to prevent these serious complications.

## SUMMARY

1. The second leg of the unilateral diabetic amputee shares the fate of the first rather often and relatively soon.
2. Current diagnostic and treatment modalities do not seem to have altered this fate significantly.
3. Bilateral, as well as unilateral, diabetic leg lesions may develop prior to the other manifestations or recognition of the diabetes itself, and occur almost as often in the mild as in the severe disease, and under fair or poor control. Neither the severity of diabetes nor its control seems to be the main determining factor in the development of leg lesions.
4. The demonstration of vascular impairment in the hands of diabetic patients with leg lesions gives further evidence of the systemic nature of this complication.

## SUMMARIO IN INTERLINGUA

*Le Destino del Secunde Gamba in le Amputato Diabetic*

1. Le secunde gamba del unilateralmente amputate diabetic ha satis frequentemente e relativamente tosto

le mesme destino como le prime.

2. Le currente modalitates diagnostic e tractamental non pare haber alterate iste facto significativamente.

3. Diabetic lesiones de gamba, bilateral si ben como unilateral, pote disveloppá se ante omne altere manifestationes o mesmo ante le recognition del diabete mesme; illos occurre in leve casos del morbo quasi tanto frequentemente como in casos sever e in casos de adequate regulation si ben como in casos mal regulate. Ni le severitate de diabete ni le grado de su regulation pare esser le principal factor determinatori in le disveloppamento del lesiones de gamba.

4. Le demonstration de difficultates vascular in le manos de pacientes de diabete con lesiones de gamba representa un prova additional pro le natura systemic de iste complication.

#### REFERENCES

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### *Falls a Major Cause of Death*

Accidental falls are a major cause of mortality in the United States, accounting for more than 20,000 deaths a year, or a death rate of twelve per 100,000 population. The loss of life resulting from falls is more than three times that caused by fires and explosions, nearly ten times that from accidents involving firearms, and about fifteen times the toll from aircraft accidents.

Somewhat over half of the people fatally injured in falls—about 11,000 a year—sustain their injuries in and about the home. This large proportion reflects the relatively high frequency of falls among older people, who generally spend a major part of their time at home. About 1,000 fatal falls each year take place on streets and highways, and lesser numbers occur in public buildings, in places of recreation and sport, on farms, and in industrial places. It should be noted, however, that only 2 per cent of all fatal falls—little more than 400 a year—result from accidents in factories, mines and quarries, and other industrial places.

Falls from ladders account for at least 300 deaths a year. The majority of these fatalities occur in and about the house, males comprising nine tenths of the victims. Approximately 3,800 deaths annually are attributed to falls out of windows, from roofs, trees, chairs, beds, and to other falls from one level to another.

Nearly 4,000 deaths annually are reported as due to falls on the same level—on the floor, ground, sidewalk,

street, and the like. Nearly nine tenths of the people reported as fatally injured in falls on the same level are sixty-five years of age and older.

The death rate from falls decreases moderately from infancy to a minimum at the school ages and then rises progressively with advance in age, slowly at first but very sharply at the older ages. The concentration of the mortality from falls in later life is much more pronounced for females than for males. In fact, under age seventy-five the death rate is higher for males than for females in each color group, but thereafter the sex ratio of the mortality is sharply reversed. Nonwhite persons generally have a higher mortality from falls than the white until the older ages.

There is little doubt that the toll from accidental falls can be reduced. One way to prevent such accidents is to keep the house in good repair; even slight variations in walking surfaces may cause slips or missteps, especially among the aged. Illumination should be adequate and light switches properly located. Additional attention needs to be focused on personal factors contributing to falls, such as undue haste, faulty judgment, and physical limitations.

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