

THE ROLE OF PLANTAR TRAUMATISMS IN THE APPEARANCE OF PLANTAR ULCERS

Júlia-Edit Fekete¹, L Gy Fekete²

1. Public Health Center, Târgu-Mureș, România

2. Dermatology Clinic, Târgu –Mureș, România

Abstract. Aim. The aim of the present study was to summarize the conclusions of the literature regarding the role of plantar traumatism in the appearance of plantar ulcers. **Materials and methods.** The data base Medline was used for the identifying the literature in the field. We selected the studies the demonstrated a correlation between traumatism and plantar ulcers and papers published as full text and abstracts too. We decided that a numbers of 3 studies satisfied our criteria that have formed our methanalysis. **Results.** In the selected studies, the plantar ulcer caused by diabetes is a well documented and described clinic notion. These studies evaluate the importance of different risk factors of the plantar ulcers. All by the studies mention the plantar traumatism, measured by a higher plantar pressure, as a risk factor for the appearance of the ulcers, as well as of the late complications as: leg amputation or other ulcers. **Conclusions.** There are studies that show the association between plantar ulcers. The studies taken into account by our methanalysis underline plantar traumatism as a risk factor for the appearance of plantar ulcers.

Key words: plantar, traumatism, ulcer, methanalysis, risk factor

Rezumat. Obiective. Trecerea în revistă a concluziilor altor studii din literatură privind rolul traumatismelor plantare în apariția ulcerațiilor plantare. **Material și metode.** Pentru identificarea articolelor am accesat baza de date bibliografică a MEDLINE. Am selectat articolele care să demonstreze o corelație între traumatism și ulcer plantar, articolele publicate *in extenso* și rezumate. După studierea articolelor am decis că 3 studii satisfac criteriile noastre, pe baza cărora am efectuat recenzia. **Rezultate.** În articolele studiate ulcerul plantar pe un picior diabetic este o noțiune bine documentată și descrisă clinic. Aceste studii evaluează importanța diferiților factori de risc în apariția ulcerațiilor. Toate studiile menționează traumatismul plantar, măsurabil prin presiunea plantară ridicată, ca un factor de risc în apariția ulcerațiilor, precum și în apariția complicațiilor tardive, ca amputația membrului sau apariția de noi ulcerații. **Concluzii.** Există studii care demonstrează asocierea dintre traumatismele plantare și apariția ulcerelor plantare. Studiile recenzate subliniază calitatea de factor de risc a traumatismelor plantare în apariția ulcerațiilor plantare.

Cuvinte cheie: plantar, traumatism, ulcer, metaanaliza, factor de risc

INTRODUCTION

Plantar mal perforant (MPP, chronic plantar ulcer) is a loss of plantar skin substance, characterized by prolonged evolution and resistance to treatment. Huriez, quoted by in 1971 considered,

that MPP represents about 1‰ of dermatologic, diseases (7). Dimitriu in 1972, in a study of 385 cases of chronic ulcers of the inferior limbs, found MPP in 3.6% of the cases (6). The disease is found mainly in men

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around the age of 50. MPP appears in patients who are heavy alcohol consumers, smokers and who have prolonged labor conditions in orthostatism and/or with prolonged physical plantar traumas, exposed to some occupational noxes, such as polyvinylchloride (8, 13). The most frequent etiological factors are: diabetes, alcoholic toxic polyneuropathy and arteriopathies of the inferior limb (4, 5). Less frequent causes are: Bureau-Barriere syndrome, latent syphilis, plantar neoplasms, deformations of the instep, etc. In case of diabetes and polyneuropathy it is necessary to study the action of many etiological factors in the same time (1, 3, 9, 11).

Methanalysis is a research method which answers a clearly formulated question and which uses explicit and systematic methods to identify, choose and critically evaluate relevant researches, as well as to collect and analyze the data obtained from the studies included in the review.

OBJECTIVES

The objectives of the present study were: to find out if there are any studies that demonstrate association between plantar traumatism and appearance of plantar ulcers; to summarize the conclusions of other studies about plantar traumatisms as risk factors in the appearance of plantar ulcers; to have a scientific data base for the clinical and therapeutic conduct in plantar ulcers.

MATERIALS AND METHODS

Our searching strategy was identifying the articles concerning plantar ulcers

epidemiology within MEDLINE data base. We have searched for articles with the key words: plantar ulcers and trauma.

The selection criteria for including studies into our analysis were the followings:

- to demonstrate a correlation between traumatism and plantar ulcer;
- articles with full text and abstracts;
- language: English, Romanian.

The selection criteria for excluding studies from our analysis were the followings:

- articles with case descriptions;
- articles concerning the physiopathogenesis and treatment of MPP;
- articles about studies with less than 25 cases;
- articles in other languages than the mentioned ones.

We have identified 281 articles. After studying them we have selected 23 articles. The used key words were: traumatism, plantar ulcer, MPP. After studying the articles we have decided, that 3 studies comply with the above mentioned criteria and we have done the review based on these 3 articles.

The methodological quality of the included studies

1. *Smith DG et al*: Repeated minor traumas and amputation of the inferior limb in diabetic patients at increased risk: incidence, spike events, etiology and amputation level in a prospective cohort study (12).

This study determines the incidence, spike events, etiology and amputation level in a prospective cohort study that involved 400 patients with diabetes and plantar ulcers. The high number of

studied individuals is justified by the high incidence of the disease. Data collecting is prospective. The study addresses a certain target problem. The method used is good to answer the questions asked.

2. *Murray HJ et al*: Association between callus formation, high plantar pressure and neuropathy in diabetic plantar ulcers (10).

It is a prospective cohort study which investigated if callus and plantar traumatism can cause plantar ulcer on the foot of a diabetic patient with neuropathy. The data of 63 patients have been analyzed with acceptable methods. The results have been statistically significant. The used statistical methods are proper. Data collecting was prospective and the size of the studied group is acceptable.

3. *Bennett PJ et al*: Analysis of risk factors in neuropathic ulcers in diabetic patients (2)

This study evaluated the importance of different risk factors in the appearance of ulcers on a relatively small number of cases. Data collecting was prospective. It was a case/control study with statistically valid results. The study answers the asked questions and results were statistically significant. The used statistical methods are adequate.

RESULTS

1. *Smith DG et al*: 11 patients have suffered amputation of the inferior limb in this cohort (ratio is 13.8/1000 persons). The analysis of spike events showed that only one amputation has been caused by shoes, 6 amputations have been caused by minor repeated traumatisms which have lead to the

progress of the vascular disease (dry gangrene from critical ischemia), 1 has been caused by a traumatism suffered at pedicure and 1 caused by decubital ulcer.

2. *Murray HJ et al*: 7 ulcers have appeared during the studied period. Plantar pressure has been higher at the group with ulcer than at the group without ($p=0.04$), with a relative risk (RR) to develop ulcer of 4.7 times higher in the area with high plantar pressure. This result has been compared with a risk of 11 patients to develop ulcer appearing under the callus and with a risk of 56.8 to develop ulcer appearing on a previously ulcerous area.

3. *Bennett PJ et al*: There haven't been found any important differences in age, sex, weight index, length and diabetes type between those with plantar ulcer and the control group. Plantar pressure and repeated traumas have been much higher ($p<0.01$) and the flexibility of the ankle much reduced ($p<0.01$) in the case of neuropathic ulcers if compared with the control group. There was found a growing tendency of HbA1c in the group with ulcer ($p=0.06$).

DISCUSSION

In the studied articles, plantar ulcer in patients with diabetes was very well documented and clinically described concept. These studies evaluated the importance of different risk factors in the appearance of ulcers. All of them mentioned plantar ulcer that is measurable through the high plantar pressure as a risk factor in the appearance of ulcers, as well as in the

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appearance of belated complications, such as amputation of the limb or appearance of new ulcers. Plantar traumatism had a more pronounced impact towards plantar ulceration on a diabetic leg with peripheral neuropathy than in patients without diabetes or neuropathy. One of the studies confirmed that in the anamnesis of a plantar ulcer the presence of plantar callus and local traumas were aggravating risk factors for the appearance of plantar ulcer. These studies were statistically significant, only one of the studies dealing with a limited number of cases. Conclusions are correct and they were based on concrete data. The studies suggest that prevention of minor plantar traumas, also including plantar accidents suffered at home, deserves more attention especially in the case of patients with diabetes and who present peripheral polyneuropathy also.

CONCLUSIONS

1. In our methanalysis were included studies which demonstrated the association between plantar traumas and appearance of plantar ulcers.
2. The reviewed studies emphasized the idea that plantar traumas are certain risk factors for the appearance of plantar ulcer
3. Implications for practice:
 - attending physicians have to treat plantar traumas very seriously;
 - being at the border of many specialties, the solution of preventing initial as well as recurrent plantar ulcers would be to organize multi-disciplinary teams of professionals, considering the strategy of the monitoring of ulcers as a solution for saving legs from being amputated;
4. Implications for research:
 - moreover, patients' education has an important role in preventing ulcers, such as instructions concerning feet hygiene, avoiding traumas, daily examination, the use of proper shoes and the necessity of immediate treatment of new lesions.

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