

DIABETIC FOOT. A LITERATURE REVIEW

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Abstract: Goal: To review the literature on the advances in the knowledge of the diabetic foot, its treatment, complications and, above all, the therapeutic options for the diabetic foot based on the most frequent types of bacteria and their behavior before antibiotics. **Materials:** A review of the most relevant articles on the subject published in recent years, obtained by a search in the MEDLINE and GOOGLE ACADEMICO databases, was made. **Results:** The diabetic foot is a clinical alteration of neuropathic etiopathogenesis and induced by sustained hyperglycemia, in which with or without coexistence of ischemia, and prior traumatic trigger, produces injury and/or ulceration of the foot; It occurs in 1 to 4% of the general population or 10 to 20% of diabetic patients that has precipitating, triggering, and aggravating factors. Excelling in the triggering factors in improper use of shoes and the lack of self-care of the feet. The main classifications for diabetic foot are the Meggit-Wagner and Texas classification. There are well-established criteria for hospital admission of these patients based on the severity of the wound, the evolutionary state of the disease, its comorbidities, and the personal and social condition of the patient. The great variability of bacteria that infects the diabetic foot is evidenced, as well as their different behaviors when faced with antibiotics, which makes it difficult to establish an adequate initial empirical treatment. **Conclusion:** The multidisciplinary treatment of the disease, the wounds and recommending an opportune diagnosis, the early initiation of an adequate empirical antibiotic scheme based on the frequency and local bacterial sensitivity, as a fundamental pillar when defining the antibiotic scheme to be used.

Keywords: diabetes, diabetic foot, infection, amputation, bacteria, bacterial resistance

INTRODUCTION

Diabetes is a complex and chronic endocrine-metabolic disease that requires long-term multidisciplinary care, currently considered by the WHO as a global Public Health problem. American Diabetes Association (2017), Olokoba et al. (2012), Whiting et al. (2011). In 2014, 422 million people in the world were diagnosed with Diabetes, representing a prevalence of 8.5%. QUIEN. Global report on diabetes (2016), will present itself in 1 in 10 people due to inadequate diet, sedentary lifestyle and obesity. National Institute of Public Health (2016). In Latin America, the prevalence fluctuates between 6.6% in Bolivia to 12.4% in Chile; in Ecuador, the prevalence is 7.3%. WHO – Country profiles for diabetes, (2016). The diabetic foot occurs between 10 to 20% of diabetics, of which 80% will develop an ulcer and 70% at some point in their lives will suffer some type of amputation. Yazdanpanah (2015), Echeverria (2016). The complications of diabetes are acute and chronic. Acute complications include diabetic ketoacidosis (DKA) and chronic complications can affect 70% of patients, these can be: microvascular (Polyneuropathy, retinopathy, diabetic nephropathy) and macrovascular) and those of macrovascular origin (coronary disease, cerebrovascular disease). Rivera-Tovar (2018). The Diabetic Foot is defined as a clinical alteration with an etiopathogenic neuropathy base and induced by sustained hyperglycemia, in which with or without coexistence of ischemia, and prior traumatic trigger, produces injury and/or ulceration of the foot. International Working Group on the Diabetic Foot (2013). Diabetic foot treatment includes 3 well-established pillars: Stabilization of diabetes mellitus and its comorbidities, adequate nutrition, and wound care. In the treatment of the wound, they include the use of antibiotics, which must initially be based

on knowledge of the type of bacteria and its resistance to antibiotics in that geographical location. Ignorance of pathogenic bacteria and the susceptibility of bacteria to antibiotics causes inadequate antibiotic treatment, the use of next-generation broad-spectrum antibiotics encouraged by multiple publications that affirm the dramatic and exponential increase in recent decades of antimicrobial resistance considered a medical dilemma and a global threat. Camou-Zunino (2017).

DIABETIC FOOT

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PATHOPHYSIOLOGY

The presence of the diabetic foot is a degenerative evolutionary process where three types of factors are added: predisposing (risk), triggering (beginning of the lesion) and aggravating (facilitates complications) such as infection and amputation. The predisposing factors are those that already exist in all diabetics: nervous (neuropathy), vascular (macro and microangiopathy) that will develop diabetic neuropathy over time, which will eventually generate arthropathy of the lower extremities. International Working Group on the Diabetic Foot (2013). Triggering or precipitating factors are those that initiate injury to a vulnerable or high-risk foot, including mechanical trauma and local hygiene. Those of a traumatic type can be thermal, chemical or mechanical. Thermal trauma is direct and injures part or all of the thickness of the skin, depending on the intensity of the heat and the contact time. Chemical trauma by contact of solids, liquids

or gases that injure the skin by action of its composition. Mechanical trauma produced by action of different force of solid objects on the skin of the foot to cause damage. Castillo et al (2014). There are three situations in which mechanical forces can injure the risk foot with existing neuroischemic injury. An intense impact with a large or small object, impact with a small object that causes a very localized force that will injure the skin in a very small area, and light pressure sustained over a long evolutionary period will cause ischemic necrosis of the skin in different places; such as wearing tight shoes for a whole day, very loose shoes, presence of foreign bodies in the shoes. Repetitive normal and moderate stress for prolonged periods of time will cause inflammation of the skin and then necrosis. Castillo et al (2014).

DIABETIC FOOT CLASSIFICATION

There is a heterogeneity of classifications of the diabetic foot, each from different perspectives that have been structured for several years. The idea of a classification is to have a quick, complete and easy-to-use vision, which allows a homogeneous and reproducible interpretation of the lesions, for the practical purposes of establishing severities, treatment principles and possibilities of complications. There are many classifications of Diabetic Foot among which we can name: GIBBONS Classification, FORREST AND GAMBORG-NEILSEN Classification, PECORARO AND REIBER Classification, BRODSKY Classification, University of Texas Classification of Diabetic Foot Lesions, LIVERPOOL Classification System, S(AD) SAD Classification System, Simple Staging System (SSS), VAN ACKER/PETER Classification, PEDIS Classification System, DE Classification System PA, Strauss and Aksenov Wound Score, Diabetic Ulcer

Severity Score-Duss, SINBAD Classification System. Of these the most used is Wagner and Texas. González - Blanes (2012), Gonzales et al (2018), despite the fact that it is known that it does not meet all the objectives of an ideal classification.

DIABETIC FOOT COMPLICATIONS

The complications of the diabetic foot are: neurotic pain, ulcer, ischemia, infection and amputation.

Diabetic ulcer: They are skin lesions in some part of the foot, especially in pressure areas. The prevalence of diabetic foot ulcers varies according to sex, age and population, therefore the range varied from 4% to 10%. The most important risk factors for its presentation are diabetic neuropathy, peripheral arterial disease and foot trauma mentioned above. Alexiadou-Doupis (2012). Other related risk factors are: male gender, more than 10 years of disease, high body mass, comorbidities such as retinopathy, peripheral vascular disease, heart and/or kidney disease, elevated glycosylated hemoglobin (HbA1C), foot changes: foot deformity, joint stiffness, imbalance, abnormal gait, high plantar pressure, and inadequate foot self-care habits. NICE (2015). These characteristics of the feet increase the possibility of injuries due to direct trauma, inadequate shoes, aggravating acute injuries; that by going unnoticed can worsen by increasing in size and/or depth and even become infected and cause amputation or death of the patient. Iraj et al (2013). For this reason, in diabetic foot care, a physical examination of the feet by a second person is recommended every 2 days at least; because the visual deficit and diminished touch of the diabetic is not reliable, the criteria as a self-evaluator.

Neuropathy: The nerve fibers in the diabetic demyelinate causing the loss of

sensitivity to pain, and to temperature in the initial stages, then there is loss of sensitivity to vibration and superficial sensitivity; and finally affecting the motor part that causes atrophy of the intrinsic muscles of the foot, causing contractures of the long flexor and extensor muscles, causing hammer and claw toes, altering the distribution of the load of the foot. July - Galleguillos (2009). Autonomic neuropathy leads to Charcot arthropathy, due to decreased vasomotor and glandular responses, with this there is decreased skin hydration and decreased capillary perfusion, causing dryness, cracking, edema and fissures and, ultimately, deformity, change of foot support points; favoring ulcers, which are doors of infection, as they are not diagnosed on time Beltrán et al (2001). **Infection:** The infection occurs in pre-existing wounds on the feet; diabetic ulcer is the main type of lesion. Diabetic foot infection is one of the most serious complications of patients with diabetes mellitus throughout their lives, it is one of the most frequent causes of hospitalization, non-traumatic amputation and death of the patient due to sepsis, due to not receiving adequate management; which increases morbidity and mortality. Early detection and immediate and adequate initiation of treatment are essential. The approach to diabetic foot infection must be multidisciplinary with early diagnosis, adequate antibiotic treatment and the taking of appropriate microbiological samples González - Blanes (2012).

Amputation. Vascular lesions occur early in diabetes, with a marked pattern in the lower extremities. Ischemia can contribute up to 40% to the appearance of ulcers and leads to amputation. Amputation in these cases is a surgical medical procedure. Diabetes mellitus increases the risk of lower limb amputation 30-40 times more than the general population Quilici et al (2016). Amputation occurs in 16.3% of patients with diabetic foot Medina

(2018). The prevalence rate of amputations in the general population due to diabetic foot ranges from 0.2 to 4.8% Seguel (2012); the two types of amputations must be differentiated, minor amputation occurs in 41.4% and major amputations in 14.2%, because the possibility of amputation ranges from one finger, several fingers, part of the foot, the entire foot and even ankle and leg, which deteriorates the quality of life of German-Nieto patients (2015). It is also important to emphasize that in various studies they state that 50% of amputations can be avoidable, with education in self-care and foot care standards, on which primary care actions and policies must be intensified. lipsky (2012).

Hospitalization criteria. When the diabetic foot condition has progressed, due to multiple causes, the indications for hospitalization of patients with diabetic foot are established, which in most cases are diabetic feet considered severe. These indications have 3 approaches: characteristics of the wounds, decompensation of the diabetic disease and personal and social conditions of the patient. These indications are (Roldan et al 2017):

High risk infections that threaten the integrity of the limb; infection in patients with poor circulation increases the risk of gangrene, great swelling and edema in the feet, ascending cellulitis, involvement of the deep spaces of the foot, osteomyelitis.

General condition complications: sepsis, dehydration, renal failure. diabetic decompensation (hyperglycemia), lack of response to correct treatment in 4-5 days.

Personal and social conditions: non-cooperative or non-self-sufficient patient, absence of caregiver, impossibility of adequate home care by primary care medical teams (lack of medical personnel, inaccessible housing), housing without the minimum conditions, among others.

Treatment: Treatment has 3 well-established pillars: Stabilization of diabetes mellitus and its comorbidities, adequate nutrition, and wound care. Wound treatment includes healing and use of antibiotics with an appropriate empirical scheme.

The definition of the antibiotic scheme to be used initially becomes a major problem, since there is no record of the most frequent pathogenic bacteria in health institutions and the lack of knowledge on the sensitivities and resistances of each bacterium. This obliges medical personnel to use one of the schemes available in the guidelines or protocols proposed by national or international scientific societies or government institutions; Unfortunately, these guides present a great variability of schemes. For example: The Endocrinology Service of the Instituto Autónomo Hospital Universitario de Los Andes in Venezuela recognizes coagulase-negative *Staphylococcus*, *Enterococcus* spp., *Enterobacteria* such as *Escherichia coli*, *Corynebacterium* spp., *Pseudomonas aeruginosa*, *Bacteroides fragilis* and *Peptostreptococcus*, as the main bacteria that infect diabetic foot wounds (Rincón et al. 2012); On the other hand, in the Clinical Guidelines for Diabetes (2008) the most frequent bacteria are *S.aureus*, *S.epidermidis*, *Staphylococcus* spp, *Enterococcus* spp, *Pseudomonas aeruginosa*, *Proteus mirabilis* and the anaerobes are *Bacteroides*, *Peptostreptococcus* and *Peptococcus*). Findings that do not match the bacteria found in daily practice. The Endocrinology Service of the Instituto Autónomo Hospital Universitario de Los Andes de Venezuela recommends the following combinations in this order for these lesions: Fluoroquinolones + Metronidazole; Third generation cephalosporins + Metronidazole; Piperacillin-Tazobactam or Carbapenems + Linezolid or Vancomycin; Ertapenem + Linezolid or

Vancomycin; Tigecycline + Fluoroquinolones or Amikacin (Rincón 2012); that differ from the antibiotics recommended by the Ecuadorian Diabetic Foot Society: ceftriaxone, ampicillin-sulbactam, levofloxacin, amoxicillin + clavulanic acid, trimethoprim sulfamethoxazole, ciprofloxacin, combined or not with clindamycin, linezolid with or without aztreonam, ertapenem, cefuroxime with or without metronidazole, ticarcillin-clavulanate, piperacillin-tazobactam, and daptomycin with or without aztreonam, levofloxacin or ciprofloxacin with clindamycin, piperacillin-tazobactam, imipenem-cilastatin, and vancomycin with ceftazidime with or without metronidazole. SEPID (2017). This great variability of options causes the medical teams in charge of diabetic foot to not agree on the antibiotic scheme to be used, even in the same health institution, in the same hospital department, by the treating physician, since he does not have adequate information on his geographical area, he uses the scheme of the guide or protocol that he best trusts. All

of this contributes to the existing difficulty in medical treatment of diabetic foot infection, causing treatment failures due to inadequate knowledge of the type of microorganisms and their capacity to resist antimicrobials in each hospital, delay in obtaining culture results and antibiograms for the establishment of specific treatments, high treatment cost that causes compliance with the indication, very frequent use of latest-generation broad-spectrum antibiotics, due to ignorance of local profiles of antimicrobial resistance. Camou-Zunino (2017). Finally, all the guidelines, protocols as part of the conclusion recommend an opportune diagnosis and the early start of an adequate empirical antibiotic scheme based on the frequency and local bacterial sensitivity, as a fundamental pillar when defining the antibiotic scheme to be used. Sáenz et al (2017), and that this is related as much as possible to the specific antibiotic scheme of the results of the culture and antibiogram of the patients, which on many occasions does not occur.

REFERENCES

American Diabetes Association. Standards of Medical Care in Diabetes - 2017. Journal of Clinical and Applied Research and Education: Diabetes Care, 2017; 40(suppl. 1): s1-s135. [Consultado 08-08-2018], Disponible En: http://care.diabetesjournals.org/content/diacare/suppl/2016/12/15/40.Supplement_1.DC1/DC_40_S1_final.pdf

Olokoba AB, Obateru OA, Olokoba LB. Type 2 Diabetes Mellitus: A review of current trends. Oman Medical Journal, 2012; 27: 269-73.

Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Research and Clinical Practice, 2011; 94(3):311-21. World Health Organization. Global report on diabetes. Geneva, 2016. p: 86. [Consultado 08-08-2018], Disponible en: http://apps.who.int/iris/bitstream/handle/10665/204871/9789241565257_eng.pdf;jsessionid=3EE89DB4B53C96AACC6786271D103F50?sequence=1

Organización Mundial de la Salud – Perfiles de los países para la diabetes, 2016. [Consultado: 28-08-2018]. Disponible en http://www.who.int/diabetes/countryprofiles/ecu_es.pdf?ua=1

Yazdanpanah L, Nasiri M, Adarvishi S. Literature. Review on the management of diabetic foot ulcer. World J Diabetes 2015; 6:37-53. [Consultado: 26-08-2018]. Disponible en: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4317316/pdf/WJD-6-37.pdf>

Rivera M, Tovar H. Características sociodemográficas y clínicas de los pacientes con descompensaciones agudas de la diabetes tipo 2 en el Hospital de San José, Bogotá, Colombia 2010-2013. Revista Colombiana de Endocrinología, Diabetes y Metabolismo. Volumen 5, número 3, julio de 2018. [Consultado: 28-07-2018]. Disponible en: <http://revistaendocrino.org/index.php/rcedm/article/view/428/567>

Hospital Universitario Ramón y Cajal de Madrid. Protocolo de cuidados Pie Diabético PRT7PD/001 junio 2005 pp:3. [Consultado: 28-07-2018]. Disponible en: <http://www.madrid.org/cs/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1202756185419&ssbinary=true>

Grupo de Trabajo Internacional sobre el Pie Diabético. Guía práctico y específico para el tratamiento y la prevención del pie diabético. 2013. [Consultado: 27-08-2018]. Disponible en: <http://iwgdf.org/wp-content/uploads/2013/01/guid-prevention-es.pdf>

Camou T., Zunino P., Hortal M. Alarma por la resistencia an antimicrobianos: situación actual y desafíos. Revista Médica de Uruguay, 2017; 33(4): pp:104-127. [Internet]. [Consultado: 02-08-2018]; http://www.scielo.edu.uy/scielo.php?script=sci_arttext&pid=S1688-03902017000400104&lng=es

Castillo R., Fernández J., Castillo F. Guía de práctica clínica en el pie diabético. Archivos de Medicina 2014; 10(2:1). [Consultado: 15-08-2018]. Disponible en: <http://www.archivosdemedicina.com/medicina-de-familia/gua-de-prctica-clnica-en-el-pie-diabtico.pdf>

González J., Blanes J. Aspectos fundamentales a tener en cuenta en la atención a la infección del pie diabético en urgencias. Emergencias 2012; 24: 211-218. [Consultado: 28-07-2018]. Disponible en: [http://www.dep4.san.gva.es/contenidos/urg/archivos/guias/2012/Infecci%C3%B3n%20del%20pie%20diab%C3%A9tico%20\(SEMES%202012\).pdf](http://www.dep4.san.gva.es/contenidos/urg/archivos/guias/2012/Infecci%C3%B3n%20del%20pie%20diab%C3%A9tico%20(SEMES%202012).pdf)

González de la Torre H., Berenguer Pérez M., Mosquera Fernández A., Quintana Lorenzo M., Sarabia Lavín R., Verdú Soriano J. Clasificaciones de lesiones en pie diabético II. El problema permanece. Gerokomos [Internet]. 2018; 29(4): 197-209. [Consultado 07 Septiembre 2022]; Disponible en: <https://scielo.isciii.es/pdf/geroko/v29n4/1134-928X-geroko-29-04-00197.pdf>

Iraj B, Khorvash F, Ebneshahidi A, Askari G. Prevention of diabetic foot ulcer. International Journal of Preventive Medicine, 2013;4:373-6. [Consultado 23-08- 2018]. Disponible en: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3634178/> National Institute for Health and Clinical Excellence (NICE).

Diabetic foot problems: prevention and management. London 2015. [Consultado 28-07-2018]. Disponible en: <https://www.nice.org.uk/guidance/ng19/resources/diabetic-foot-problemsprevention-and-management-pdf-1837279828933>

Julio R. Galleguillos I. Diabetes y enfermedad vascular periférica. Revista Médica Clínica Los Condes 2009; 20:687-97. [Consultado: 25-07-2018]. Disponible en: http://www.clc.cl/clcprod/media/contenidos/pdf/MED_20_5/15_Dr_Julio.pdf

Beltrán C, Fernández A, Giglio M, Biagini L, Morales R, Pérez J et al. Tratamiento de la infección en el pie diabético. Revista Chilena de Infectología, 2001; 18:3. [Consultado: 15-09-2018]; 18(3):212-224. Disponible en: https://scielo.conicyt.cl/scielo.php?script=sci_arttext&pid=S071610182001000300008&lng=es. <http://dx.doi.org/10.4067/S0716-10182001000300008>

Alexiadou K, Doupis J. Management of diabetic foot ulcers. Diabetes Therapy, 2012; 3:4. [Consultado: 28-07-2018]. Disponible en: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3508111/pdf/13300_2012_Article_4.pdf

Quilici MTV, Del Fiol F, Vieira AEF, Toledo MI. Risk Factors for Foot Amputation in Patients Hospitalized for Diabetic Foot Infection. Journal of Diabetes Research. 2016; 8931508. [Consultado: 28-08-2018]. Disponible en: DOI:10.1155/2016/8931508; <https://www.hindawi.com/journals/jdr/2016/8931508/>

Medina-Ochoa E, García-González E, López-Ascencio R, Vásquez C. Tipos de Bacterias en Cultivos de Secreción de Pie Diabético en Pacientes de Manzanillo, Colima, México. Archivos de Medicina. Vol. 14 No. 2:10. 2018. [citado 2018-09- 05]. Disponible en: <https://dialnet.unirioja.es/servlet/articulo?codigo=6499274> 2025 ISBN 978-980-402-276-0

Seguel G. ¿Por qué debemos preocuparnos del pie diabético? Importancia del pie diabético. Revista Mededica Chile, 2013; 141; pp: 1464-69. [Consultado 22-08- 2018], Disponible en: <https://scielo.conicyt.cl/pdf/rmc/v141n11/art14.pdf>

Lipsky BA., Berendt AR., Cornia PB., Pile JC., Peters EJ., Armstrong DG., Deery HG., Embil JM., Joseph WS., Karchmer AW., Pinzur MS., Senneville E. Infectious Diseases Society of America. America clinical practice guideline for the diagnosis and treatment of diabetic foot infections. Clinical Infection Disease. 2012; 54(12): pp:132-73.

German M, Nieto N. Prevalencia de amputaciones y re amputaciones en pacientes con diagnóstico de pie diabético hospitalizados en el Hospital Guayaquil “Abel Gilbert Pontón” en la ciudad de Guayaquil desde enero 2013 hasta enero 2014. Tesis Médica. 2015. Disponible en: <http://repositorio.ucsg.edu.ec/bitstream/3317/3842/1/T-UCSG-PRE-MED-344.pdf>

Roldán A, Ibáñez P, Pérez D, Navarro M, Alba C, et al. Guía de Práctica Clínica: Consenso sobre Úlceras Vasculares y Pie Diabético de la Asociación Española de Enfermería Vascular y Heridas (AEEVH) 3ª ed. 2017. pp: 58-107. [Consultado 08-08-2018], Disponible en: <http://gneaupp-1fb3.kxcdn.com/wpcontent/uploads/2017/06/Guia-de-Practica-Clinica-web.pdf>

Espinoza-Tavera A., Hernández-Gracia G., Cantú-Ramírez R.C., Díaz-López A., ÁvilaAguilar S., García-García E.A., Rivera-Sánchez G., Bocanegra-García V. Prevalencia y perfil de resistencia a antibióticos de microorganismos aislados de infecciones en pie diabético. *CienciaUAT*, 2014. [Revista en la Internet]. 9(1): pp: 84-89. [Consultado 02-09-2018]; Disponible en: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S2007-78582014000100084

Rincón Y, Gil V, Pacheco J, Benitez I, Sanchez M. Evaluación y tratamiento del Pie. *Revista Venezolana Endocrinología y Metabolismo* 2012; 10 (3):176-187. [Consultado: 28-07-2018]. Disponible en: http://www.scielo.org.ve/scielo.php?script=sci_arttext&pid=S1690-31102012000300008&lng=es

Grupo de trabajo de la Guía de Práctica Clínica sobre Diabetes tipo 2. Guía de Práctica Clínica sobre Diabetes tipo 2. Madrid: Plan Nacional para el SNS del MSC. Agencia de Evaluación de Tecnologías Sanitarias del País Vasco; 2008. Guías de Práctica Clínica en el SNS: OSTEBA N° 2006/08.

Sociedad Ecuatoriana de Pie Diabético (SEPID). Guía Práctica de Pie diabética. Guayaquil 2017. [Consultado 20-08-2018]. Disponible en: <http://sepid-ec.com/wpcontent/uploads/2016/10/SEPID-V7-GPC-PD.pdf>

Sáenz-Talavera R., Flores-Ramírez C., Contreras-Rabelo G. Frecuencia bacteriana y sensibilidad antibiótica in vitro en pacientes con diagnóstico de pie diabético en el Hospital Central del Estado de Chihuahua, Chihuahua. *Revista Mexicana de Angiología*. 2017; 45(2): pp: 57-63. [Citado 2018-09-05]. Disponible en: <http://www.medigraphic.com/pdfs/revmexang/an-2017/an172c.pd>