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RESEARCH ARTICLE

THE MANAGEMENT OF DIABETIC FOOT IN THE EMERGENCY

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Abstract

Background: Diabetic foot ulcers infected mainly increase the risk of amputation. The aim of our study was to define the predictors of amputation of the diabetic foot, draw the clinical, bacteriological and therapeutic profile of patients presenting to the emergency

Aims: To define the predictors of amputation of the diabetic foot, draw the clinical, bacteriological and therapeutic profile of patients presenting to the emergency

Patients/methods: This is a prospective observational study spread over twelve months in the medical and surgical emergencies including 108 patients. We investigated socio-demographic, clinical data and treatment of patients hospitalized for diabetic foot.

Results: The mean age of patients was 63.7ans, 92.6% were diabetic type2. 57.4% of lesions were acute (ulcers (37%), wet gangrene (33.3%), dry gangrene (13%), cellulitis (24.1%) and acute Charcot foot (9.3%)), 63% following a trauma and 33.2% due to unsuitable footwear. 81.5% had clinical signs of angiopathy and 64.5% of neuropathy. The lesions were classified: uninfected (9.3%), low (9.3%), moderate (38.8%) and severe (42.6%) according to the IDSA / IWGDF and 0D (46.3%) 3D (18.5%) 3B (7.4%) according to the University of Texas. Staphylococcus aureus was the most germ solved. Antibiotics administered if osteitis was Amoxicillin-clavulanate (57.5%) and Ertapenem (31.5%) in his absence. 14.8% received debridement, 1.9% for revascularization and 83.3% for amputation. In our study, the risk of amputation increases with the average socioeconomic level, severity of the infection and the presence of osteitis /osteomyelitis while drying feet after ablution was a protective factor. 9.3% of recurrence and 5.6% of deaths were recorded.

Conclusions: The multidisciplinary management of diabetic foot is paramount. The surgery is common immediately but rarely necessary, medical treatment is the first-line therapy avoiding abusive amputations. Prevention requires the establishment of specialized units.

Summary: Diabetic foot ulcers infected mainly increase the risk of amputation. The aim of our study was to define the predictors of amputation of the diabetic foot, draw the clinical, bacteriological and therapeutic profile of patients presenting to the emergency. This is a prospective observational study spread over twelve months in the medical and surgical emergencies including 108 patients. In our study, the risk of amputation increases with the average socioeconomic level, severity of the infection and the presence of osteitis /osteomyelitis

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Introduction:-

Diabetes is a clinical syndrome characterized by elevated blood glucose levels above normal values that can lead to specific metabolic and tissue complications.

Apart from acute metabolic complications, diabetes is the cause of several chronic complications, notably vascular complications such as macroangiopathy or microangiopathy and nerve damage with the risk of foot ulcers that can lead to amputation of the foot or leg. The diabetic foot is defined according to the 2011 IWGDF (International Working Group on the Diabetic Foot) as "any infection, ulceration or destruction of the deep tissues of the foot associated with neuropathy and/or peripheral arteriopathy of the lower limbs in diabetic patients."

The ultimate objective is to obtain healing and, if possible, the restitution of a functional foot, limiting the risk linked to each invasive intervention, avoiding high amputation but also gestures that are too damaging to the foot.

The management of the diabetic foot must be multidisciplinary. Indeed, the dialogue between the various disciplines (medical, surgical, biological and imaging) allows for the optimal sequencing of these different steps without delay in an optimal manner.

Patient And Methods:-

Our work falls within the framework of prospective cross-sectional observational studies aimed at evaluating medical practices. It was carried out in the of the hospital arrazi of the University Hospital Mohamed VI of Marrakech during the period extending from May 1, 2020 to august 30, 2021, that is to say a duration of 16 months.

The aim of our study is to determine the predictive factors of amputation in patients with a diabetic foot in the emergency room, to make a descriptive analysis of the clinical and paraclinical characteristics and to establish the bacteriological profile of diabetic patients with a foot lesion

In this study, 108 patients admitted for diabetic foot in the emergency room of Arrazi Hospital in Marrakech were selected after informed consent

Results:-

108 diabetic patients, predominantly male, 90 men (83.3%) versus 18 women (16.7%), mean age 63.7 ± 10.3 years, were included in this study.

70 (64.8%) of our patients were on insulin, 28 (25.9%) on OADs while 10 (9.3%) were on a mixed treatment (Insulin and OADs). 48 (88.9%) of them were followed for their diabetes.

Complications of diabetes were present in 30 (27.8%) cases of the study population. They were retinopathy in 24 (22.2%) cases and renal failure in 6 (5.6%) cases.

La médiane d'évolution du diabète était de 12.5 [8 ; 21] années chez des sujets présentant majoritairement un diabète de type2, 100 (92.6%).

In our work, 46 (42.6%) of our patients had in addition to the diabetic foot hypertension, 36 (33.3%) a dyslipidemia, 10 (9.2%) a cardiopathy and 2 (3.7%) a renal insufficiency. 32 (29.6%) were smokers and 24 (22.2%) combined smoking and alcoholism.

Known familial diabetes was present in 58 (45.7%). 30 (27.8%) of the patients had a history of foot ulcers and 44 (40.7%) had a history of lower limb amputation.

The study of previous antibiotic therapy showed that

70 (64.8%) of our patients had received antibiotic therapy before admission. 50 (46.3%) of the patients had received antibiotic therapy beyond 4 months and 12 (11.1%) of the patients were under antibiotic coverage in the 14 days prior to hospitalization.

Clinically, ulceration was the most common lesion in 40 (37%) cases and wet gangrene in 36 (33.3%) cases. Phlegmons and dry gangrene were present in 26 (24.1%) and 14 (13%) cases respectively. The association of more than two lesions was noted in 56 (51.9%) subjects. Ulcerations with bone exposure were predominant in 24 (22.2%), while 12 (11%) did not extend beyond the subcutaneous plane.

The majority of these lesions were unilateral, affecting the right foot in 62 (57.4%) cases. Bilateral involvement was noted in only 6 (5.6%) cases. Acute lesions represented 62 (57.4%) cases involving the toes in 78 (72.2%) cases.

(72.2%) cases, the sole of the foot in 24 (22.2%) cases, the head of the metatarsals in 20 (18.5%) cases.

The main triggers of the foot injuries were trauma in 68 (63%) cases and wearing tight shoes in 36 (33.2%) cases.

Signs of angiopathy were present in 88 (81.5%) patients, of whom 64 (59.3%) had gangrene. The association of gangrene, signs of ischemia and/or abolition of the and/or abolition of the peripheral pulse was present in 48 (44.4%) cases.

Neuropathy was detected in 70 (64.8%) of cases. Foot infection criteria were absent in 8 (7.4%) of our patients. Most of our subjects had more than one foot infection criterion. Erythema 84 (77.8%), foul odor 78 (72.2%), pus 74 (68.5%), heat 70 (66.8%), infiltration 70 (64.8%) and pain 66 (61.1) were the main criteria of infection present. Onychomycosis was the most frequent associated infection 44 (40.7%) cases.

According to the IDSA/IWGDF classification, uninfected lesions represented only 9.3% (10 patients). In contrast, 46 (42.6%) subjects had severe infection and 42 (38.8%) had moderate infection.

The University of Texas classification showed that 50 (46.3%) patients were classified as grade/stage 0D, 20 (18.5%) as grade/stage 3D, and 8 (7.4%) grade/stage 3B.

Amputation involved 100% of the population in grades 0C, 3B, 2D and 3D, 92% of patients classified as 0D and 50% of subjects classified as 1D.

In our population, 74 (68.5%) of our patients had 90 specimens (44 (40.7%) superficial and 46 (42.6) deep). 8 (21.6%) subjects had both superficial and deep samples. Among the 44 superficial samples, 28 (63.7%) were polymicrobial, 14 (31.8%) monomicrobial and 2 (4.5%) were sterile. Concerning the 46 deep samples, 28 (60.9%) were polymicrobial, 16 (34.8%) monomicrobial and 2 (4.3%) sterile.

Among the germs in the superficial samples, gram-positive cocci were present in 36 (81.18%) samples compared to 30 (68.2%) for gram-negative bacilli (GNB). The predominant gram-positive cocci were *Staphylococcus aureus* (27.27%), *Enterococcus faecalis* (18.18%), *Streptococcus agalactiae* (B) and *Streptococcus alpha hemolyticus* (9.09%). The most common gram negative bacilli were *Proteus mirabilis* (18.18%), *Klebsiella pneumoniae* (13.63%), *Enterobacter cloacae* and *Morganella morganii* (9.09%).

Gram-positive cocci were present in 18 (78.3%) of the deep samples, compared to 28 (60.9%) for gram-negative bacilli (GNB). Among the GPC, *Staphylococcus aureus* and alpha-hemolytic streptococci were present in 26.09% and 21.73% of the deep samples respectively, coagulase-negative streptococci and *Enterococcus faecalis* in 8.69%. The gram-negative bacilli (BGN) most represented in the deep samples were *Proteus mirabilis* in 14.63%, *Pseudomonas aeruginosa* and *Escherichia coli* in (8.69%). Only one sample contained *Corynebacterium* species, gram positive bacillus (GPB) (4.35%).

In our series, 10 (9.3%) patients had a radiological Charcot foot deformity; 6 (5.6%) patients had bone destruction and 18 (16.7%) patients had claw toes. 68 (63%) patients had osteitis on the standard foot X-ray. It should be noted that all the patients had a standard X-ray of the foot, whereas only 10 (9.3%) of the patients underwent an

echodoppler of the lower limbs and/or an angioscanner, which revealed distal arteritis of the lower limb in 6 (60%) and critical ischemia in 4 (40%) cases.

Antibiotic therapy was administered in 104 (96.3%) patients, 96 (88.9%) of whom received monotherapy, 2 (1.8%) dual therapy and 6 (5.7%) triple therapy.

Conservative surgery was performed in 18 (16.7%) patients and amputation/regularization in 90 (83.3%) of the patients who underwent surgery.

The rate of minor amputations was 59.2% (64 cases) and 24.1% (26 cases) for major amputations. It should be noted that two of the 108 patients underwent both a conservative procedure and an amputation.

Discussion:-

Diabetes is a real public health problem. The WHO estimates that the number of diabetics will reach 366 million worldwide by 2030 [1,2, 3].

In Morocco, currently, about one and a half million people suffer from diabetes, a prevalence of 14% if we consider the age group over 50 years of age. [4]

According to a 2005 study, 12-25% of diabetic patients will develop a foot ulcer during their lifetime[5], of which 40-80% will become infected [6]. Diabetic foot lesions have functional and psychological[7] repercussions, affecting the quality[8] and even the life expectancy [9]. They increase the risk of amputation by 15 to 20 times more than in the general population[10].

The ENTRED study (2007-2010) gives a prevalence of amputation of 1.5%[11]. This rate increases with age, with a maximum prevalence after 75 years[12, 13]. In the United States, 50% of non-traumatic amputations are performed in diabetic patients[14]. 85% of diabetic amputations are caused by a minor foot wound and four out of five have an identifiable external origin[15,16], which is a priori avoidable.

The average age of our patients was 63.7 ± 10.3 . The majority of studies reported mean ages ranging from 47 to 78 years. [17-23]

Our series was composed of a majority of male patients (83.33%). Apart from the study by Lamchahab, F.Z., et al. noted a predominance of male patients. [17, 19, 21-25].

In our series, we have a predominance of type 2 diabetes (92.6%). Our results are consistent with those of the majority of studies [17, 19,20, 21, 23, 27, 28].

Most of our subjects (64.8%) were on insulin alone. Our results are in line with the majority of studies [17, 21, 29]. This use of insulin reflects glycemical imbalance and poor compliance.

In our study, 98 (90.7%) patients had an infection. Infection aggravates the wounds by its risk of deep extension, which can lead to amputation and sometimes be life threatening [30]. The diagnosis is clinical and not microbiological [31]. It is based on the presence of at least 2 signs of inflammation (erythema, pain or tenderness, heat or infiltration) and/or the presence of purulent secretions. The presence of non-purulent secretions, friable or granular tissue, a foul odor and/or redness of the ulceration margins should also suggest infection. Systemic signs of infection include: temperature $> 38^\circ$ or $< 36^\circ$, heart rate < 90 /min, respiratory rate > 20 /min, and/or a $\text{PaCO}_2 < 32$ mmHg [32].

Underlying osteoarticular involvement should be considered when there is resistance to treatment or recurrence of infection of an ulceration, especially in relation to a bony prominence, unfavorable or protracted evolution despite optimal management and satisfactory arterial supply [33]. Rough bone contact [32, 34], abnormal mobility of a toe and the erythematous appearance of a sausage toe are also in favor of osteitis [35] (Figure 31). We noted 68 (63%) cases of osteitis, a much higher percentage than that found at Ouran (42.39%)[29] and Yopougnon (21%)[36].

The collection of samples by superficial curettage-swabbing of the ulcer base, using a curette or a sterile scalpel [37, 38] allows better identification of the pathogens, reducing the risk of contamination by colonizing aerobic flora [39, 40].

In our series, as in some authors, we obtained a good correlation between the results of superficial and deep samples [41]. In our study results, both in superficial and deep swabs, methicillin-sensitive *Staphylococcus aureus* is in the majority. Our results are in agreement with the majority of studies that have reported a predominance of staphylococci with 57% in the Auvergne University Hospital [42], 17.28% in the Setif University Hospital [43]. The study by LIPSKY [35] noted a clear predominance of gram-positive cocci (71.6%) compared to gram-negative bacilli (38.4%). This same trend was found in our series.

In our series, foot radiography was systematically performed. It revealed that 34 (63%) subjects had osteitis on foot radiography. This is an often sufficient and necessary morphological examination for any subject presenting with a diabetic foot for the first time.

The sensitivity of radiography is 60% and its specificity is 65%. It can be used to look for deformities or bone destruction, the presence of gas in the soft tissues (indicating the presence of anaerobic germs), and the presence of a bacteria.

The presence of gas in the soft tissues (indicating the presence of anaerobic germs), the identification of radioactive foreign bodies and the search for an underlying fracture [44]. Arterial calcifications may also be present, indicating vascular involvement.

In our study, angioscan and echodoppler were indicated in only 5 (9.3%) patients for suspected critical ischemia. Systolic pressure index (SPI), big toe systolic pressure (BTSP) and transcutaneous oxygen pressure (TCPO₂) are simple examinations to evaluate the severity of ischemia. In our daily practice, the unavailability of these examinations limits the precise evaluation of vascular lesions.

In our study, 104 (96.3%) subjects received antibiotic therapy. Only 98 (90.7%) of them were infected and 10 (9.3%) had ischemic lesions alone, not infected according to the IWGDF classification. 6 (5.56%) received excess antibiotic therapy.

During our study, all our patients systematically benefited from a vascular surgeon's opinion who decided, after clinical examination and possible paraclinical examinations, of the necessity or not of an amputation and its level. The trauma and orthopedic surgeon or visceral surgeon on duty performed the procedure and monitored the patient's post follow-up of the patient.

In case of severe ischemia, revascularization must be systematically discussed. However, treatment of the infection (discharge, debridement, antibiotic therapy) must be immediate and revascularization considered once the infectious situation has been brought under control [45]. medical treatment.

In our study, 18 (16.7%) patients underwent conservative surgery and 90 (83.3%) patients underwent amputation. Emergency surgery must be as conservative as possible and any emergency amputation, even minor, must remain exceptional and always associated with complete medical treatment [46]. The surgical decision must be multidisciplinary (vascular physician and surgeon, diabetologist-podologist, orthopedist) because it leads to a change in the statics of the foot and exposes the patient to recurrence or even high amputations.

Conclusion:-

Mucoid degeneration of the anterior cruciate ligament of the knee is often misunderstood and confused with a partial rupture of the ACL. Its diagnosis must be suspected in front the diabetic foot represents one of the silent, serious and disabling complications of diabetes. It poses a real public health problem. Its multidisciplinary management is essential in order to ensure an ideal quality of care for the patient. The initial approach to the treatment of the diabetic foot in the emergency room is based on a careful evaluation of the wound in terms of its ischemic, neuropathic and infectious components. infectious components on the one hand, and the patient's general condition on the other

Conflicts of interest

The authors declare no conflict of interest

Authors' contributions

Rabie khatchi: authorship, work design, data acquisition, interpretation of data for work, writing and bibliographies

Mohamed moussadik: co-author, writing, data acquisition, bibliographies

Mohammed Amine Benhima: co-authoring, critical review, editing and evaluation

Imad abkari: co-authoring, critical review, editing and evaluation

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