

Stem Cells and Nanosilver Saved Diabetic Foot

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ABSTRACT

We showed a case of 65 years-old Iraqi male who suffered from uncontrolled type 2 diabetes mellitus for 13 years. He developed an ulcer in his left big toe for five days in March 2021. The clinical assessment proved an infected stage 3 diabetic ulcer. We discussed the patient's condition with the patient/family, and they agreed and then consented. The therapy continued for one month and incorporated four sessions of surgical debridement, application of stem cells, and nanosilver. The patient/family noticed marked wound healing documented by the camera. Stem cells and Nanosilver therapy saved diabetic foot, and we advise it.

KEYWORDS: Stem cells, Nanosilver, Treatment, diabetic foot.

INTRODUCTION

A diabetic foot signifies a foot ulcer that exists in a patient who has diabetes mellitus, sensory neuropathy, plus peripheral arterial disease. It is a chronic outcome of diabetes mellitus. The sensory neuropathy in a chronic state of hyperglycemia of a diabetic patient leads to dryness of the foot skin and a diminished capability to feel pain from minor injuries that advance to a deep tissue ulcer.

Peripheral neuropathy plus peripheral vasculopathy drives poor wound healing. Hyperglycemia and a strict diet regimen cause malnutrition and an immunodeficiency state. Poor diabetic control affects leukocyte function, causing a lack of body resistance that ends with deep tissue infections and poor healing. Diabetic foot ulcer infection is the most familiar causality of non-traumatic amputation nationwide. Stem cells represent the cells that have conceivable to grow into different types of tissues in the body. Stem cells reside in the human bone marrow to generate new blood cells, and they exit the bone marrow after maturation to enter the blood. There are three major classes of stem cells: adult, embryonic, and induced pluripotent stem cells.

Scientists employed stem cells to substitute destroyed tissues, repair organs that did not operate properly, explore cell genetic defects, and treat challenging diseases¹.

Stem cell therapy is an autologous medicine; it is safe for the patient to diminish the hazard of cell rejection. Stem cell therapy is a self-reparative method².

Scientists utilized stem cell treatment for the diabetic

foot. Stem cells exhibited a hopeful remedy since they bypassed and targeted the essential healing tools and abnormal cell signals in the wounds to foster tissue repair.

Thousands of articles in google scholar depicted successful animal and human experiments, plus meta-analyses and reviews concerning the use of stem cells in

curing challenging diabetic feet. Nanosilver therapy is a type of treatment that utilizes tiny particles of silver, known as nanosilver, to target and kill bacteria and other microorganisms. This therapy is being researched for its potential use in treating various infections, including those resistant to antibiotics³.

Some studies have suggested that nanosilver may effectively treat conditions such as wound infections, urinary tract infections, and lung infections. However, more research is needed to understand this therapy's safety and efficacy fully, and it is not currently approved for use in humans⁴.

Only two papers from Iraqi researchers employed stem cell therapy in animals. Those Iraqi researchers have applied stem cells in their investigations since 2003, although they did not apply stem cell therapy to human diabetic foot³. This report illustrates a brilliant stem cell therapy cure for an elderly Iraqi man. According to the authors' search, this is the pioneer and original case presentation for stem cell therapy that cured diabetic foot successfully in Iraq.

CASE REPORT

A case 65 years old Iraqi male had uncontrolled type 2 diabetes mellitus of 13 years duration, and the latest level was 310 mg/dl. He had ischemic heart disease for three years, uncontrolled hypertension for over nine years, and knee osteoarthritis. He developed a left-infected ulcer on the undersurface of the left black big toe over five days. The offensive odor and gangrenous toe pushed the patient/his family to reach Al Zahrawy Center for Stem Cells in Baghdad in March 2021. Clinical assessment, laboratory, and radiological tests proved infected with stage 3 diabetic

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foot ulcer.

We discussed the condition and management lines with the patient/family. The patient and his family agreed and consented. The one-month course incorporated four sessions of surgical debridement utilizing washing by normal saline and nanosilver solution for disinfection. (**Figure I & II**)

We instructed the patient/family on glycemic control and ordered Piperacillin / tazobactam® (4g/500 mg)/ vial for one week, then oral drugs Augmentin® (875/125 mg PO 12hr) for the next three weeks.

We injected stem cells around the neurovascular bundle of the left leg and the foot. We infiltrated stem cells at the edge of the wound after excision with a well-prepared autologous stem cells solution already taken from his right iliac crest and processed by highly-developed laboratory tools. The patient/family noticed marked wound healing documented by the camera and then publicized on Alkhyaat social media. (**Figure III**).

Figure I: Left big toe after wound excision



Figure II: The same wound after sequential wound debridement



DISCUSSION

Researchers hope to thwart and cure diabetic foot. Scientists created many classifications and scoring systems, such as Wagner, PEDIS, and SINBAD, for the diabetic foot. The Wagner classification (the favorite system by Iraqi surgeons) classified diabetic ulcers according to the depth of infection and tissue damage. In this presentation, the authors faced a third

Figure III: Six weeks after stem cell therapy



-stage infected gangrenous big toe ulcer in a poorly controlled type 2 Diabetes Mellitus Iraqi patient.

Wet gangrene is a hidden infection like an iceberg, although the rapidity of the process, the marked change of color, and the offensive odor force the patient and his family to run for help. The classic surgeons excised the dead tissues, then sequential wound debridement and different regimens of broad-spectrum antibiotics. These usual remedies overcome many, but not all, cases of late-presentation-infected diabetic ulcers. There are challenging ulcers resistant to the response that worsen rapidly to proximal muscles and necessitate proximal amputation, even several amputations in some cases.

Well-known surgeons utilized all types of stem cells for treating diabetic foot ulcers, and stem cells proved their remarkable effects on challenging wound healing. They overcame the corrupted cellular healing processes and differentiated into the desired cells.

Alkhyaat wanted a higher chance of successful growth of stem cells by placing them at the edges of the excised ulcer, and the vascularity at the edges is more profuse than at the centre. **Alkhyaat** added more stem cell injections around the neurovascular bundle of the left leg/foot to enrich angioplasty proliferation by the proliferative endothelial progenitor cells. Stem cells are multipotent vascular builders that contribute to the neurovascular regeneration of peripheral microvessels and surrounding nerves. The healed innervation conveys a better brain image regarding the wound processes⁴.

The pioneered nano researchers utilized the nanosilver particles in their laboratories, animals, and, later on, man. Those experimenters illustrated the prosperous influences of the nanosilver to disinfect the dresses and tools. The (Food and Drug Administration) 2011 boosted the anti-microbial benefits of nanosilver⁵.

Alkhyaat chose nanosilver particles for sterilization because they have adequate antibacterial, antiviral, and anti-parasite actions compared to traditional remedies due to their physical and chemical properties⁶.

CONCLUSION

The effects of stem cells are significant in accelerating wound healing and saving the limb. The patient/family was satisfied and continued the treatment after the cure. They were happy with the final result and acknowledged us.

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Data Sharing Statement: The corresponding author can provide the data proving the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publically.

AUTHOR CONTRIBUTION

Hamad AM: Responsible for case information

Alhiti HAR: Case detection & case report writing

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