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PVD: The Association between Endothelial Dysfunction and PVD in Patients with Diabetes Mellitus

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Abstract

Peripheral vascular disease is a common outcome in individuals with a history of DM Type II. With a constant increased amount of glucose levels in an individual's circulation can gradually lead to endothelial dysfunction. This study concludes that with improving endothelial function can lead to decreased peripheral vascular diseases in patients with diabetes mellitus. This can be done by more research regarding how to improve the functions of endothelial cells.

Keywords: Endothelial Dysfunction, Diabetes Mellitus, Patients.

Introduction

Peripheral vascular disease is a common outcome in individuals with a history of DM Type II. With a constant increased amount of glucose levels in an individual's circulation can gradually lead to endothelial dysfunction.

Case

A 77 years old female presented to the Emergency room from nursing home with exacerbated chronic bilateral lower extremity wounds on her left leg. Patient was discharged from another facility with IV antibiotic due to left lower extremity infection. Patient now returns with worsening of the infection and syncope. Patient's vitals upon arrival were BP 83/63, Pulse 99, Temperature 36.3 C, Respiratory 19, Height 157.5 cm, and Weight 55.339 kg. Upon examination patient was noted to have a 1 cm wound that is well cared for at the lower right lateral calf with no surrounding erythema. Good pulses and sensation the right foot was noted. Left lower extremity had a necrotic wound 7-8 cm in length to the left posterior leg, which is open down to the muscle without surrounding erythema or draining. Ulcerative necrotic wound to the dorsum of the left foot is also noted. The left foot had non-palpable pulses decreased sensation with very little range of motion. Patients past medical history consist of sacral ulcers, PVD, hypothyroidism, hypertension, history of deep vein thrombosis, DM Type II, COPD, and left hip surgery with the placement of a long trochanteric entry femoral nail 11 mm diameter by 33 cm length with a 130 degree neck angle and an 85 mm locking proximal hop compression screw. Patient was admitted for further evaluation and vascular surgery consultation was requested. Upon admission vascular surgeon saw patient and recommendation of possible surgical intervention was discussed with patient and family. Patient and patient's family agreed to a left above knee amputation with a detailed explanation of the procedure and risks. Orthopedic surgeon was involved as well in regards of having the prior implanted rod being removed from the patient in order to perform the above knee amputation. Patient had an uneventful surgery. Under satisfactory general anesthesia, the patient was placed in supine position. The left lower extremity was prepped and draped. Skin incision was done above the knee after the medullary rod was removed. Going through the muscles and fascia, which were transected, they were well viable with no signs of infection. The femoral artery and vein were patent, and they were highly ligated and transected. The sciatic nerve was highly ligated and transected, and the amputation at the femur bone was approximately 6 cm above the level of the skin incision. The amputation was complied by removal of the tissue of the posterior compartment. The leg was removed and sent to pathology as a specimen. Hemostasis was well secured. Proceeded by irrigation. No bleeding, no oozing. Closure of the wound layers was done, and using staples closed the skin. Dressing was applied. Patient tolerated the procedure well and was transferred to the recovery room in stable condition. Postoperatively patient had a significant decrease in nutritional intake. A nutritionist later assessed her due to her poor appetite/intake. A patient state she was not eating well from earlier this year, but denies any difficulty chewing/swallowing. Her total intake was 0-25% of meals, drinking her Glucerna shakes. Patient denied a feeding tube at this point.

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Nutrition evaluation at this point recommends continuing regular diet, continuing Glucerna TID, continue daily MVI and Vitamin C to aid in wound healing, Remeron prescribed with considering ordering a second appetite stimulant, and a goal of increasing PO intake >25% of meals. Patient was later discharged to a rehab facility for further recovery. With the instruction of regular wound care and changing of dressing. Patient would also be seen by surgeon in six week of time to have her staples removed.

Discussion

Patient was very much for not wanting to have above-mentioned procedure done. This had a great emotional impact on patient as patient was showing signs of depression. Patient was prone to instant crying and distress when surgeon came to make rounds on patient. This depression continued postoperatively as well. Physically patient was in a lot of pain preventing much movement both preoperatively and postoperatively. Patient states she had a decrease in activity for a while now prior to her hospital admission. No short-term changes were noticed in patient's mood or physically activity was noticed. For long-term patient is in hopes of being in less pain and having a better quality of life. Endothelial dysfunction can lead to poor circulation and poor wound healing, leading to significant chances of amputations. The vascular endothelium, the functional lining of blood vessels, plays a critical role in vascular homeostasis [2]. This imbalance in homeostasis can be contributed to type II diabetes mellitus in many occasions. Being able to recreate balance in this homeostasis can improve quality of life in patients with PAD. There is some evidence that endothelial dysfunction in PAD patients can be improved upon but the exact method of measuring the function of endothelial cells are still being researched upon. A recent study compared flow-mediated dilatation (FMD), peripheral artery tonometry (PAT), and serum nitric oxide (NO) measures of endothelia function, which was measured by using reactive hyperemia index (RHI) in patients with peripheral artery disease (PAD) against age/gender-matched controls [2]. The researchers concluded that FMD and PAT both demonstrated a lower hyperaemic response in patients with PAD; however, FMD results in PAD patients were unequivocally reduced whereas half the PAD patients had RHI values above the established threshold for endothelial dysfunction [2]. Another recent study was done to see how endothelial progenitor cells (EPCs) play a role in diabetes mellitus. Diabetes mellitus is characterized by endothelial dysfunction and a three- to four-fold increase in cardiovascular risk, and diabetic vasculopathy is an important source of morbidity and mortality [1]. The study has concluded that there was a significant decrease EPCs in a diabetic patient. EPCs are defined as fibronectin-adherent peripheral blood-derived cells up taking acetylated low-density lipoprotein and biding Ules-selectin in culture [1]. When researchers measured the circulating progenitor cells there was a significant correlation between the glucose level when the blood was collected. It was also concluded that DM was the most relevant risk factor in the reduction of EPC. Low circulating EPCs could account for both endothelial dysfunction and poor collateralization typical of diabetics [1].

Conclusion

One can conclude that with improving endothelial function can lead to decreased peripheral vascular diseases in patients with diabetes mellitus. This can be done by more research regarding how to improve the functions of endothelial cells.

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