

**INTRAVENOUS INSULIN VS SUBCUTANEOUS INSULIN IN
DIABETIC FOOT ULCER PATIENT -A PROSPECTIVE RANDOMIZED
STUDY**

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ABSTRACT:

AIM & OBJECTIVE:

To study the effect of wound healing in diabetic foot ulcer patient

Objectives are to compare optimal blood glucose level ,rate of wound healing and wound infection in diabetic foot ulcer patient .

METHODS & MATERIALS:

A total of 20 patient with diabetic foot ulcer admitted in ward between March 2022 to August 2022 were recruited and are grouped into Group A [INRAVENOUS INSULIN] and Group B [SUBCUTANEOUS INSULIN]. Rate of wound healing, wound infection and optimal blood glucose value are compared between these group.

RESULT:

The study result proved that patient under intravenous insulin showed more significant observation than patient under subcutaneous insulin

CONCLUSION:

To conclude in our study ,intravenous insulin is found to be more effective in wound healing ,reduced wound infection and maintain blood glucose level than subcutaneous insulin .Finally intravenous insulin achieved effective wound healing.

KEY WORD: Intravenous insulin , subcutaneous insulin ,diabetic foot ulcer

INTRODUCTION:

- Diabetic foot ulcers are among the most common complications of patients who have diabetes mellitus which is not well controlled . It is usually the result of poor glycemic control, underlying neuropathy, peripheral vascular disease, or poor foot care .It is also one of the

common cause for osteomyelitis of the foot and amputation of lower extremities. These ulcers are usually in the areas of the foot which encounters repetitive trauma and pressure sensations. The disease is typically chronic, and an interprofessional approach will have the best outcome [1] Diabetic foot ulcers (DFU) are a common reason for hospitalization of diabetic patients and frequently result in amputation of lower limbs

- The risk of death at 10 years for a diabetic with Diabetic foot ulcer is twice as high as the risk for a patient without diabetic foot ulcer . Emerging evidence underscores the importance of treatment for diabetic foot ulcer .In this picture insulin is a tool for the achievement of normal blood glucose concentration. Concurrently, due to the effect of insulin on the above-mentioned processes, it can be a drug affecting diabetic foot ulcer[2]
- Diabetes mellitus is a challenge to surgeon because these patient are at increased risk infection than that of non diabetic individual with wound. Infection in diabetic foot ulcer patient result in poor wound healing need for additional treatment including antibiotics , extended hospital stay and increased health care expenditure and providing adequate nutrition. Infection may cause several problem including sepsis , organ failure and even death.
- Diabetes mellitus is a common clinical condition and it is the major cause of morbidity and mortality. Insulin deficiency leads to increased blood glucose level. In spite of high glucose level in the blood the entry of glucose into the cell is restricted and cells are starved of glucose.
- Hyperglycemia has potential to affect multiple pathway of immune system and cause decreased phagocytic and chemotactic function in neutrophils and monocytes and increased rate of apoptosis of the neutrophils and decreased ability of monocytes to present the antigen. Hyperglycemia primarily affect cellular immune function. It stimulates the inflammatory cytokines and affects the microcirculation causes increased risk of wound infection and prevents the phenomenon of normal wound healing [5].
- Glycosylation of hb and formation of glycosylated hb [HBA1C] rises in prolonged and uncontrolled diabetes three times than the normal value. Diabetic ketoacidosis and coma is one of the most important and dreaded complication. Changes in blood vessel producing myocardial infraction and stroke, microvascular changes

- Successful treatment of diabetic foot ulcer depend on administration of appropriate antibiotics, wound debridement and control of blood glucose level. Nerve damage along with poor blood flow and glucose laden tissue causes diabetic foot ulcer. Patient with blood glucose level >220mg/dl has 2.7 times higher infection rate than that of the normal blood glucose level. Strict glycemetic control in patient with diabetes mellitus undergoing surgery result in better postoperative outcomes [4] .

MATERIALS AND METHODS:

- A total of 20 patient with diabetic foot ulcer admitted in ward between March 2022 to August 2022 were recruited and are grouped into Group A [INRAVENOUS INSULIN] and Group B [SUBCUTANEOUS INSULIN].
- Rate of wound healing, wound infection and optimal blood glucose value are compared between these groups.

INCLUSION CRITERIA:

1. Non healing diabetic foot ulcer
2. Patient with uncontrolled diabetes mellitus

EXCLUSION CRITERIA:

1. Patient without diabetes mellitus
2. Patient with major comorbid illness
3. Patient with varicose vein
4. Venous ulcer
5. Patient present with peripheral arterial occlusive disease

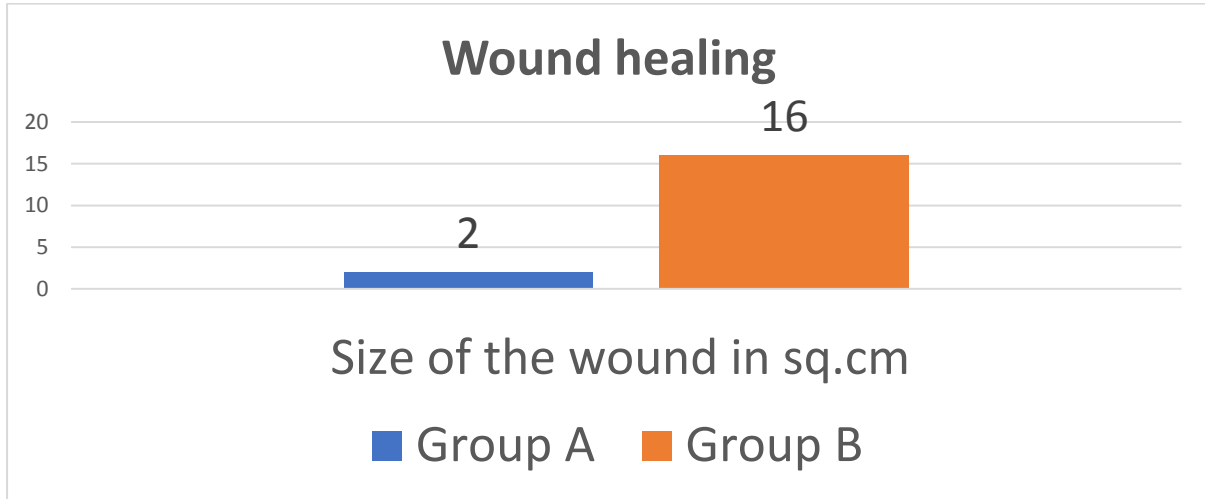
STUDY DESIGN: Prospective study

STUDY PERIOD: March 2022 to august 2022

STUDY PLACE: Sri venkateshwaraa medical college hospital and research centre

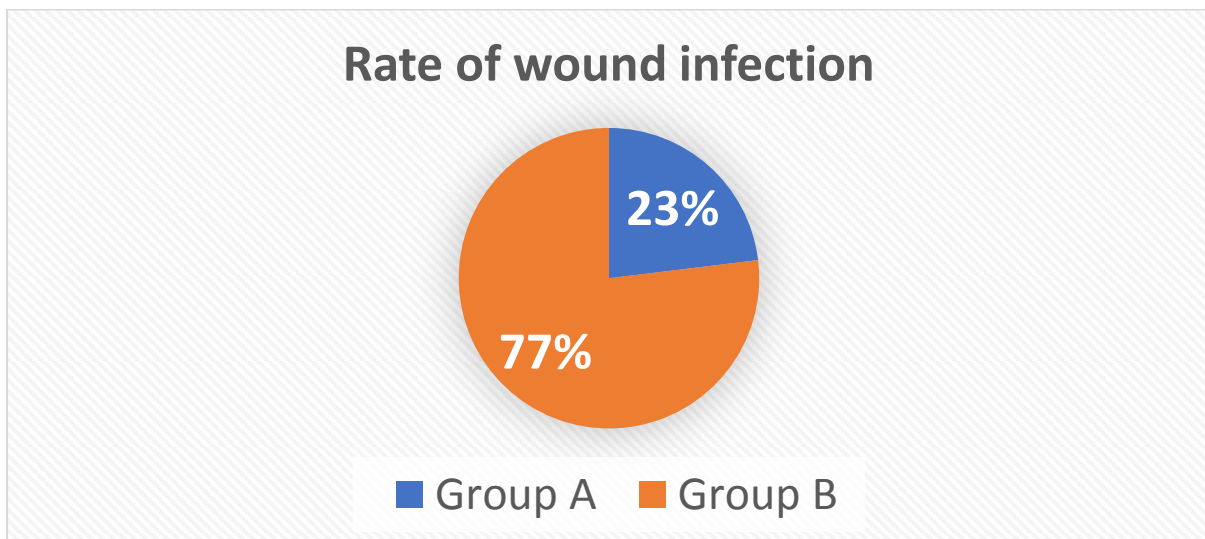
RESULTS:

Rate of wound healing:

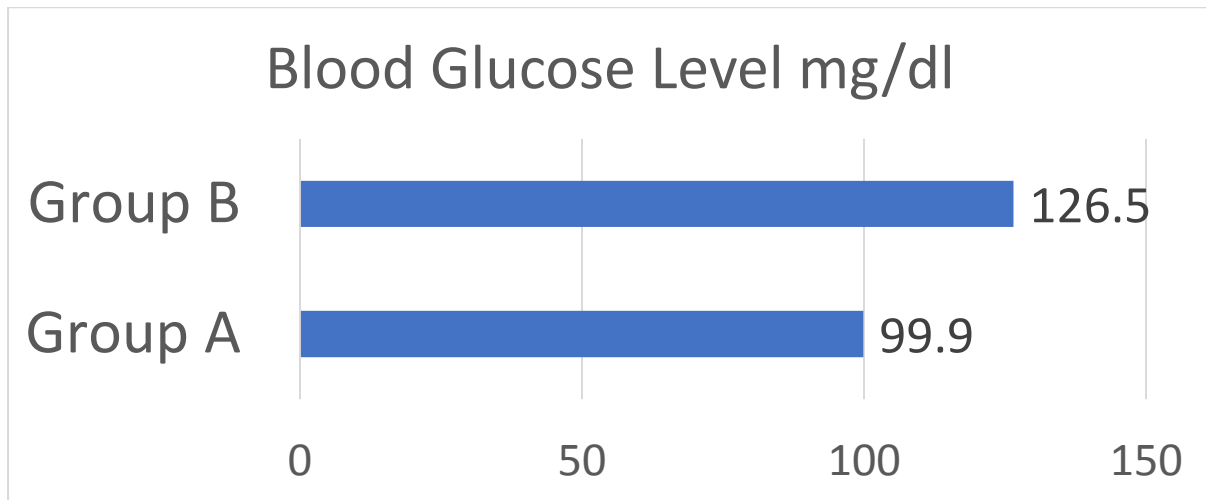


Wound is healing faster in group A patient compared to group B patient. Size of wound has been reduced in group A patient compared to group B patient and duration of stay in hospital has been reduced.

RATE OF WOUND INFECTION:



On comparison group B patient have more infection rate than group A patient Group A patient has less infection and so wound infection is minimal in patient on IV insulin

BLOOD GLUCOSE LEVEL[mg/dl]:

Blood glucose level maintained within normal limit in group A patient compared with group B patient .

DISCUSSION:

- Diabetes is a chronic disease that has a significant number of life-threatening complications, of which one of them is a foot ulcer. Diabetic foot is a common scenario in which healthcare workers will come across in daily practice [3]. For diabetic patients ,tight long term glucose control has significantly reduced the incidence and severity off many chronic complication associated with diabetes and postoperative wound infection and its complication [4] .
- The primary goal of surgeon is to provide effective wound healing and reduced infection rate in diabetic foot ulcer patient. Diabetes can produce complications including inability of wound to heal despite providing adequate wound care. At times of reduced tissue oxygen ,such as when circulation has decreased , there is anecdotal evidence that IV insulin may permit heart ,skeletal muscle, skin and other organ to function more normally and even to repair damage and heal .
- The intravenous insulin therapy encourages glucose metabolism in diabetic to normalize in multiple organ especially retina, liver ,kidney ,muscle ,nerve endings. Oral carbohydrates have been given to prevent hypoglycemia

- Insulin is a peptide hormone with physiological role and have a beneficial role in wound healing. Insulin can potentially help to restore the integrity of damaged skin. Wounds more likely to fail to reepithelialise normally ,making them susceptible to infection and the infection spread to systemic circulation further complication arose. Thus insulin stimulate wound healing and reductions in time required for wound repair [5].
- Intravenous infusion of insulin, glucose and potassium is the recommended therapy and has substituted subcutaneous insulin and have more benefit than subcutaneous insulin. Ideally insulin infusion to start with 0.5 to 1 unit /hr regular insulin. The rate of insulin infusion is adjusted to maintain blood glucose level in the range of 120 to 180mg/dl.
- Different glucose-lowering medications have promising effects on wound healing , however systemic insulin have a higher rate of better and complete wound healing. Increased microvessel density and growth of granulation tissue has been reported in patient on insulin therapy . Insulin has reduced the duration of inflammatory phase and wound reepithelialization has been improved. Topical insulin may accelerate healing of diabetic and non-diabetic wounds by enhancing the serine-threonine kinase (AKT) and extracellular signal-regulated kinase (ERK) pathways and increased expression of endothelial nitric oxide synthase (eNOS), vascular endothelial growth factor (VEGF) and stromal cell-derived factor (SDF-1alpha) [6].
- Normal blood glucose level is important for the outcome of surgical and medical conditions. Insulin infusions have been studied to achieve normoglycemia during these circumstances and have proved to be useful. Insulin given by subcutaneous injections has longer duration compared to intravenous given insulin which makes it more difficult to control. The hypothesis behind the trial is the concept that insulin infusion is more effective in reaching normoglycemia in diabetic subjects during foot ulcer infection and surgical wound infection.
- This study demonstrated that intensification of insulin therapy results in improved general condition in patients with painful diabetic foot ulcer.

This is the first study to compare the effects of intravenous and subcutaneous insulin delivery in Diabetic Foot Ulcer (DFU).

CONCLUSION:

- To conclude in our study ,intravenous insulin is found to be more effective in wound healing ,reduced wound infection and maintain blood glucose level within normal limit than subcutaneous insulin

REFERENCE:

1. Singer AJ, Tassiopoulos A, Kirsner RS. Evaluation and Management of Lower-Extremity Ulcers. *N Engl J Med.* 2018 Jan 18;378(3):302-303.
2. Armstrong DG, Boulton AJM, Bus SA. Diabetic Foot Ulcers and Their Recurrence. *N Engl J Med.* 2017 Jun 15;376(24):2367-2375.
3. Jeffcoate WJ, Vileikyte L, Boyko EJ, Armstrong DG, Boulton AJM. Current challenges and opportunities in the prevention and management of diabetic foot ulcers. *Diabetes Care* 2018;41:645–652 [[PubMed](#)]
4. Aravinth S. *Study on Perioperative Glycemic Control and Postoperative Infections* (Doctoral dissertation, Thanjavur Medical College, Thanjavur).
5. Abdelkader DH, Osman MA, Elgizaway SA, Faheem A, McCarron PA. The role of insulin in wound healing process: mechanism of action and pharmaceutical applications. *Journal of Analytical & Pharmaceutical Research.* 2016 Jan 13;2(1).
6. Vatankhah N, Jahangiri Y, Landry GJ, Moneta GL, Azarbal AF. Effect of systemic insulin treatment on diabetic wound healing. *Wound Repair and Regeneration.* 2017 Feb 20;25(2):288–91.