Research Paper Medical Science

To Study The Effect of Lumbar Sympathetic Blocks on Lower Limb Wound Healing in Diabetic Patients

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ABSTRACT

A prospective cross-sectional study was done in a total of 58 diabetic patients with lower limb wounds fulfilled the selection criteria ,were enrolled into the study and were subjected to lumbar sympathetic blocks . However four patients underwent amputation hence were excluded from the study. Most of the patients (44.83%) reported duration of diabetes from 6 to 10 years. Most of the patients (63.79%) had wound duration of a month or less. Majority of the patients (62.07%) had no sensation on the wound. (32.76%). In the present study, on day 10 of LSB, healthy granulation was noted among more than half of the study population (58.62%). On day 20 of LSB, healthy granulation was noted among majority (82.76%) of the patients. While on day 30, healthy granulation was noted among 62.07% of the patients, while complete healing of the wound was noted in 32.76% of the patients. The reduction in wound area noted on day 10, 20, and 30 from day one was statistically significant (p=0.002). Also there was significant percentage reduction in wound area on day 10 (28.50 ± 27.82 percent), day 20 (56.14 ± 117.91 percent) and day 30 (90.80 ± 9.03 percent) from enrollment. Overall the present study showed that treatment with lumbar sympathetic blocks is highly effective on patients presenting with diabetic foot ulcer.

KEYWORDS lumbar sympathetic blocks, Diabetes.

INTRODUCTION

A lumbar sympathetic block is the injection of medication into the sympathetic nervous system at the lumbar level. [1,2] These blocks may also be used in conditions in which increased circulation to a limb would be beneficial for healing as in diabetic neuropathy or slow healing wounds.

Diabetes mellitus (DM), a metabolic disease is characterized by hyperglycemia which results from defects in either insulin secretion and insulin action or both.[2] Most of the fall into two broad categories that is, Insulin Dependent Diabetes Mellitus (IDDM or type 1) and Non Insulin Dependent Diabetes Mellitus (NIDDM, or type 2).[3,4]

Worldwide, number of people with type 2 diabetes is increasing in every country. Diabetes caused 4.9 million deaths in 2014 and every seven seconds a person dies from diabetes.[5] Diabetes mellitus is a chronic and potentially disabling disease which is reaching an epidemic proportion in many parts of the world which is a major and growing threat to global public health.

The chronic hyperglycemia of diabetes results in long term damage, dysfunction of various organs, especially the eyes, kidneys, nerves, heart and blood vessels.[3] Many complications are associated with DM, these complications arise mainly due to the disruption of the vascular system resulting in inadequate circulation to the peripheral body placing the foot at higher risk of ulceration and infection.[6,7]The management of diabetic foot ulcers needs a multidisciplinary approach.[8] The successful management of diabetic foot ulcers requires offloading the wound by using appropriate therapeutic footwear,[9] daily saline or similar dressings to provide a moist wound environment, debridement when necessary, antibiotic therapy,[10] optimal control of blood glucose, and evaluation and correction of peripheral arterial insufficiency.

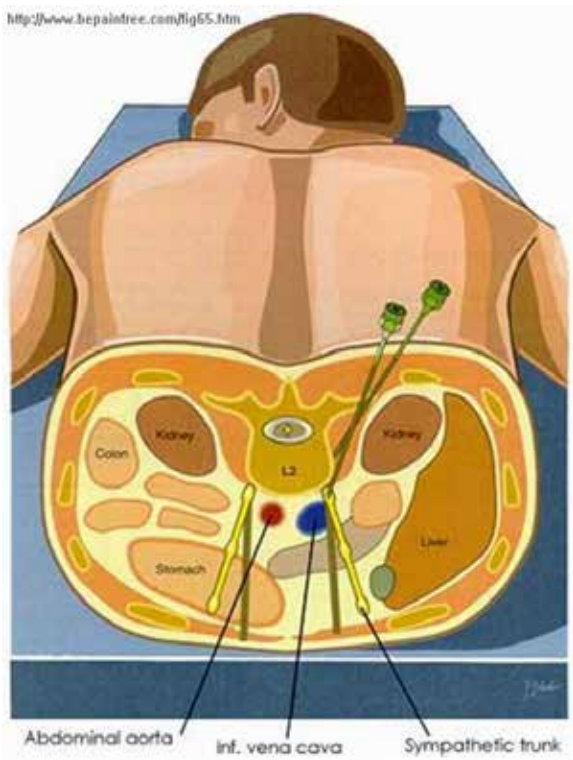
The Sympathetic nerve impulses cause the constriction of peripheral blood vessels (the arteries and veins in our arms and legs). Sometimes a sympathetic nerve may be unnecessarily stimulated as a result of injury or other trauma to the body. In this situation, the involved sympathetic nerve will cause the blood vessels in the arm or leg to constrict and remain constricted resulting in poor circulation to that limb. If the sympathetic nerve impulse is blocked, the blood vessels dilate, circulation is improved and pain relief may occur.

Based on these observations, it may be hypothesized that sympathetic nerve blocks may reduce pain associated by reducing sympathetic outflow and improve wound healing by vasodilation.[12]

Hence considering the burden of diabetic foot problems and scarcity of data on the management of lower limb wounds using lumbar sympathetic block, the present study was planned to evaluate the effect of lumbar sympathetic block in the management of lower limb wounds among diabetic patients.

Fig. 1

Fig. 2



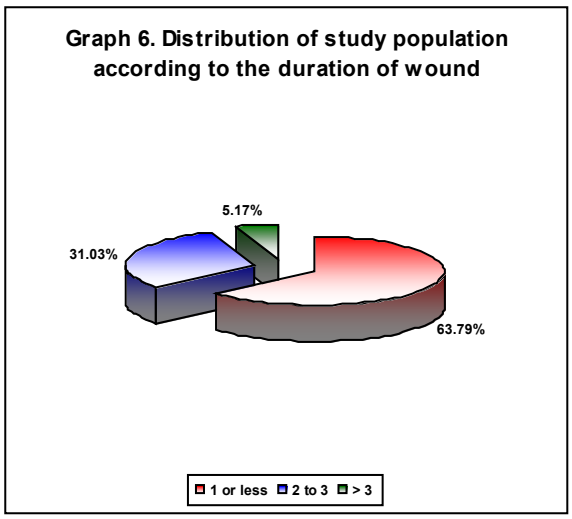
METHODOLOGY

The present study was conducted on 58 diabetic patients with lower limb wounds with approval by the Ethical Committee. The cause of wound being trauma,spontaneous,Infection,Burn,peripheral vascular diseases. Local examination of wound, with characteristics like location, extent, size, shape, edge, margin, wound area, surrounding skin, discharge and edema were evaluated. Along with it all the routine lab investigations,importantly FBS,PPBS,hba1c ,urine ketone have been sent.The patients were treated with sympathetic nerve blocks associated by reducing sympathetic outflow and improve wound healing by vasodilation. In addition, the wound was debrided to ensure an early recovery of the injured site. Ulcer examination was done and was assessed at the beginning of the study and on days 10, 20 and 30 of follow-up. Wound area measurement was recorded over the transparency sheet at beginning and on days 10, 20 and 30.The study end-point was healing of the wound which was regarded based on an acute inflammation that progressed with redness due to decrease in edema, pain sensation, warmth, increase in blood flow and loss of function. Increased blood flow is a critical first step in the process of wound healing. Rise in temperature of the affect part in lumbar sympathetic block therapeutically stimulates healing through heat thereby widening the blood vessel and by increasing blood flow resulting in initiation of a rapid healing process. Finally, the area of the wound was measured.

RESULTS

Table 1. Distribution of study population according to the duration of wound

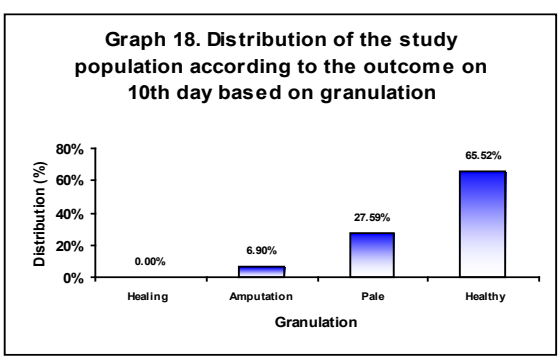
Duration (months)	Distribution (n=58)	
	Number	Percentage
1 or less	37	63.79
2 to 3	18	31.03
> 3	3	5.17
Total	58	100.00



In this study, most of the patients (63.79%) had wound duration of a month or less.

Table 2. Distribution of study population according to outcome on 10th day based on granulation

Granulation	Distribution (n=58)	
	Number	Percentage
Healing	0	0.00
Amputation	4	6.90
Pale	16	27.59
Healthy	38	65.52
Total	58	100.00



In the present study, on day 10, healthy granulation was noted among 65.52% of the patients.

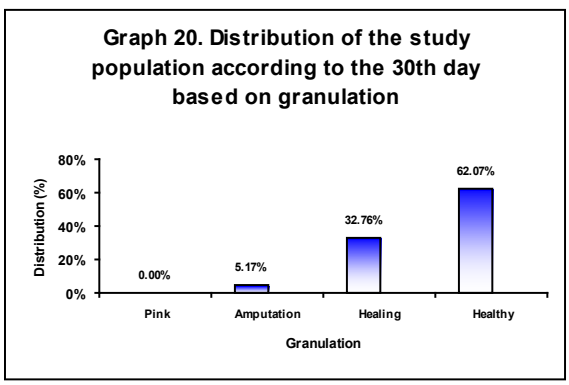
Table 3. Distribution of study population according to outcome on 20th day based on granulation

Granulation	Distribution (n=58)	
	Number	Percentage
Healing	2	3.45
Pink	4	6.90
Amputation	3	5.17
Healthy	49	84.48
Total	58	100.00

In this study, on day 20, healthy granulation was noted among 84.48% of the patients.

Table 4. Distribution of study population according to outcome on 30th day based on granulation

Granulation	Distribution (n=58)	
	Number	Percentage
Pink	0	0.00
Amputation	3	5.17
Healing	19	32.76
Healthy	36	62.07
Total	58	100.00



In the present study, on day 30, healthy granulation was noted among 62.07% of the patients, while complete healing of the wound was noted in 32.76% of the patients.

Table 5. Comparison of mean reduction in wound area from beginning to last follow up

Interval	Mean (n=58)		Median	Range	
	Mean	SD		Min.	Max.
Follow up on day 10	5.31	6.81	3.00	-8.00	35.00
Follow up on day 20	10.89	10.31	8.25	-8.00	61.00
Follow up on day 30	17.10	12.38	14.50	0.75	67.00

p = 0.002

In this study there was significant reduction in wound area from enrollment to day 30 that is 17.10 ± 12.38 cm^2. The reduction in wound area noted on day 10, 20, and 30 from day one was statistically significant (p=0.002).

DISCUSSION

Sympathetic nerve impulses cause the constriction of peripheral blood vessels (the arteries and veins in arms and legs),If the sympathetic nerve impulse is blocked, the blood vessels dilate, circulation is improved. A lumbar sympathetic block is the injection of medication into the sympathetic nervous system at the lumbar level. These blocks may also be used in conditions in which increased circulation to a limb would be beneficial for healing as in diabetic neuropathy or slow healing wounds. During lumbar sympathetic block (LSB) we monitor blood pressure, heart rate, rhythm and most importantly affected limb temperature using skin thermometer (pre and post block). A rise in temperature indicates that the lumbar sympathetic block is successful and to the later they are the signs of improvement.

Based on these observations, we hypothesized that sympathetic nerve blocks improve wound healing by vasodilation and may reduce pain associated by reducing sympathetic outflow. Vasodilation is important in exposing a wound to increased blood flow, which is accompanied by necessary inflammatory cells and factors that fight infection. In addition, debridement of the wound of devitalized tissues ensures an early recovery of the injured site.

In this study, Wound culture was positive in 58.62% of the patients. Staphylococcus aureus was the commonest organism isolated (32.76%). The wound area at enrollment was 14.88 ± 12.44 cm2. Most of the patients (56.90%) had wound area >10cm2. In the present study, on day 10, healthy granulation was noted in about two-thirds of the study population (65.52%). On day 20, healthy granulation was noted among majority (84.48%) of the patients. While on day 30, healthy granulation was noted among 62.07% of the patients, while complete healing of the wound was noted in 32.76% of the patients. Further healthy wound healing was evident through reduction in wound area that is, there was significant reduction in wound area from enrollment to day 30 that is, 17.10 ±12.38 cm2. The reduction in wound area noted on day 10, 20, and 30 from day one was statistically significant (p=0.002). Also there was significant percentage reduction in wound area on day 10 (28.50 ± 27.82 percent), day 20 (56.14 ± 117.91 percent) and day 30 (90.80 ± 9.03 percent) from enrollment was noted. The percentage reduction in wound area noted on day 10, 20, and 30 from day one was also statistically significant ($p < 0.001$).

Overall, the present study showed that treatment with lumbar sympathetic blocks is highly effective on patients presenting with diabetic foot ulcer. The average requirement of block per patient was 3.66 ± 1.12 blocks.

The effectiveness of lumbar sympathetic blocks on diabetic foot ulcers can be explained by the following mechanism. Diabetic foot ulcers occur for several reasons, some of which include mechanical changes in bone conformation, peripheral neuropathy, poor circulation or a lack of feeling in the foot, and trauma as discussed above. The effectiveness of lumbar sympathetic blocks on diabetic foot ulcers can be explained by the following mechanism.Vasodilation is important in exposing a wound to increased blood flow, which is accompanied by necessary inflammatory cells and factors that fight infection. In addition, debridement of the wound of devitalized tissues ensures an early recovery of the injured site. An acute inflammation progresses with the following manifestations in the vessels and tissues: redness due to increase blood flow; swelling, which is edema in the tissues; pain; warmth, and loss of function. These symptoms may prove inconvenient; however, all these are essential for wound healing. Increased blood flow is a critical first step in the process of wound healing. This will bring to the affected muscle the much-needed nutrients and oxygen essential to start the reparative process. This makes the widening of blood vessels vital in healing; without vasodilation, healing will not proceed. lumbar sympathetic block therapeutically stimulates healing as heat which widens the blood vessel diameter, which increases blood flow and jumpstarts the healing process.

Based on our observations we presume that this is the maiden study to evaluate effectiveness of treatment of with lumbar sympathetic blocks for the treatment of presenting with diabetic foot ulcer. A recent study by Cheng J et al.99 (2012) observed that lumbar and thoracic sympathetic nerve blocks significantly improved the circulations and reduced neuropathic pain in patient with diabetic small fiber sensory neuropathy. The analgesic effects were reproducible upon repeated blocks and are long-lasting (sustained 2–4 months after each block). These observations support the notion that the sympathetic nervous system plays a critical role in the pathophysiological mechanisms of painful diabetic polyneuropathy. This case report thus provides the first clinical evidence supporting the notion that the pain in diabetic neuropathy may be sympathetically mediated to a significant extent that has not been recognized previously. Given the sustained pain relief af-

ter each sympathetic block, the sympathetic nervous system may prove to be an important therapeutic target of pharmacological and interventional treatments for painful diabetic neuropathy. Overall the present study showed that treatment with lumbar sympathetic blocks is highly effective on patients presenting with diabetic foot ulcer with average 3.66 ± 1.12 blocks per patient within 30 days despite of long standing diabetes and elderly population.

CONCLUSION

Overall the present study showed that treatment with lumbar sympathetic blocks is highly effective on patients presenting with diabetic foot ulcer with average 3.66 ± 1.12 blocks per patient within 30 days irrespective of, duration of diabetes and age in terms of healthy granulation and significant reduction in wound area.

ACKNOWLEDGEMENT

I sincerely thank my P.G. guide Dr. Vaishali V. Gaikwad and my H.O.D Dr. Abhay Chougale without whose guidance and help this research would not have had been possible. I thank my teachers, colleagues and patients for their constant support and help.

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