



Laser Versus Reflexology on Kidney Functions in Patients with Hypertension Enrolled under Dash Diet

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Abstract: Background: Kidney functions increased in hypertensive patients. **Objectives** of this study were to determine the difference between effect of reflexology and laser on kidney functions and blood pressure. **Methods:** Sixty patients (48 women and 12 men) aged from 45-55 years old participated in this study with moderate essential hypertension ranged from 150/170 for systolic blood pressure and 90/110 for diastolic blood pressure. The patients were assigned into two equal groups in number. Group A received foot reflexology for twenty minutes while group B received laser on reflexology points for eight minutes. The management for groups done three times/week for eight weeks in association with DASH diet and their regular medications according to their physicians. Systolic and diastolic blood pressure was measured. Also, serum creatinine and serum electrolytes (sodium, potassium and calcium) were used to measure kidney functions pre and post management. **Results:** The obtained data revealed a statistically significant decrease in systolic and diastolic blood pressure and serum creatinine in group A while a statistically significant decrease in systolic and diastolic blood pressure only in group B after treatment ($P < 0.05$). There was no statistical significant difference between levels of Na, K and Ca pre and post management in both groups. **Conclusion:** Foot reflexology in addition to regular medications may be valuable to decrease blood pressure and kidney functions more effectively than laser therapy. **Key Words:** laser/ reflexology/ kidney functions/ hypertension/ DASH.

1.Introduction

Hypertension is defined as having an average blood pressure of above 140/90 as represents the heart beats (called systolic pressure) and when heart relaxes and fills with blood (diastolic pressure)¹. Already about a quarter of the population worldwide has high blood pressure. Experts warn that this percentage will increase to about 29% by 2025². The overall estimated prevalence of hypertension was 29.5%, which indicates a higher prevalence of hypertension among Arabs compared to people from the sub-Saharan African (27.6%)³.

If the blood pressure is higher than normal, and for a long time without being corrected will result in a nephron degeneration and chronic kidney disease. Impairment in renal function can increase the risk of cardiovascular disease (CVD) two- to four fold⁴. The rate of kidney failure due to high blood pressure increased 7.7 percent from 2000 to 2010⁵. Chronic kidney disease (CKD) is considered present when impaired kidney function is confirmed in two or more occasions at least 3 months apart⁶. Most people will have high blood pressure at all stages of chronic kidney disease⁷. According to the latest WHO data published in May 2014,

kidney disease deaths in Egypt reached 15,820 or 3.41% of total deaths. The age adjusted death rate is 26.63 per 100,000 of population rank Egypt 12 in the world⁸.

Most of research works seek to put a plan of management to overcome the complications to prevent it including different modalities to be safe for patients as⁹: Healthy eating (DASH diet)¹⁰, Physical activity, Maintaining a healthy weight, Managing stress, Laser therapy¹¹, Reflexology¹².

Patients and Methods:

Sixty patients of both sexes (48women and 12men) were included in this study. Their age ranged from 45– 55 years old. They suffered from essential moderate hypertension with systolic blood pressure ranged from (170/110 mmHg) and diastolic blood pressure ranged from (150/90 mmHg). Their BMI was between 30.12 to 34.67 kg/m². The patients recruited from outpatient clinic of internal medicine department in El Agouza hospital, Cairo.

Exclusion criteria were: Patients with Recent or healing fractures in foot or with unhealed wounds, active gout affecting the foot or severe circulation problems in the legs or feet. The patients were assigned into two groups equal in number: Group A (reflexology group) consisted of 26 women and 4 men who received reflexology on pressure points in feet for twenty minutes per session for three times / week. Group B (laser group): consisted of 22 women and 8 men who received high power probe laser (HPL 1.6 with one laser infrared diode 808 nm with a power of 1.6 W) on pressure points in feet for eight minutes per session(four minutes to each foot) for three times / week for eight weeks.

The management for both groups lasted for eight weeks in association with DASH diet and anti-hypertensive drugs according to their physicians. Evaluation for all patients were assessed at baseline and re-assessed after 8 weeks of management by using blood tests to measure serum creatinine and serum electrolytes (Na, K and Ca) and a sphygmomanometer and stethoscope to measure systolic and diastolic blood pressure.

Statistical analysis

Descriptive statistics are expressed as mean, minimum, maximum, standard deviation (SD) and standard error of means or number (percent). Comparison between categorical data [number (%)] was performed using Chi square test. According to test of normality, comparison between different variables in the two groups was performed using either unpaired t test or Mann-Whitney U test whenever it is appropriate.

Results:

Table (1): demographic data of both groups:

	Group A (n= 30)	Group B (n= 30)	t- Value	P-Value
Age (yrs.)	50.50 ± 3.50	50.23 ± 3.56	0.293	0.771 (NS)
Sex				
Man	4 (13.3%)	8 (26.7%)	$\chi^2= 1.667$	0.197 (NS)
Woman	26 (86.7%)	22 (73.3%)		
Height (m)	1.61 ± 0.06	1.63 ± 0.07	-1.095	0.278 (NS)
Weight(kg)	83.94 ± 8.07	86.08 ± 8.74	-0.987	0.328 (NS)
BMI(Kg/m ²)	32.38 ± 1.59	32.42 ± 1.51	-0.080	0.937 (NS)

yrs.:yearsKg:Kilogram

M:meter

NS: no significance

Kg/m²:kilogram per meter squared

After eight weeks, the results in Group A (Reflexology Group) showed that (Table.2): The mean values of SBP before management was (161.67 ± 7.91 mmHg) while the mean value after management was (122.33 ± 6.26 mmHg) which significantly decreased by 24.33%. The mean values of DBP before management was (103.67 ± 5.56 mmHg) while the mean value after management was (81.33 ± 6.29 mmHg) .So DBP had significantly decreased by 21.55%. The mean values of serum creatinine before management was (3.12 ± 1.03 mg/dl) while the mean value after management was (2.72 ± 1.03 mg/dl) .So serum creatinine had significantly decreased by 12.82%.

The mean values of potassium before management was (4.36 ± 0.43 mEq/L) while the mean value after management was (4.38 ± 0.53 mEq/L) .So potassium had no significantly decreased by -0.46%. The mean values of sodium before management was (140.61 ± 2.67 mEq/L) while the mean value after management was (140.22 ± 2.49 mEq/L). So sodium had no significantly decreased by 0.28%. The mean values of calcium before management was (9.36 ± 0.46 mg/dL) while the mean value after management was (9.28 ± 0.53 mg/dL) .So calcium had no significantly decreased by 0.85%.

While the results in Group B (Laser Group) showed that (Table.2): The mean values of SBP before management was (162.00 ± 7.14 mmHg) while the mean value after management was (131.33 ± 12.24 mmHg). So SBP had significantly decreased by 18.93%. The mean values of DBP before management was (103.33 ± 5.47 mmHg) while the mean value after management was (85.67 ± 8.17 mmHg). So DBP had significantly decreased by 17.09%. The mean values of serum creatinine before management was (3.65 ± 1.48 mg/dl) while the mean value after management was (3.61 ± 1.45 mg/dl). So serum creatinine had no significantly decreased by 1.10%.

The mean values of potassium before management was (4.51 ± 0.68 mEq/L) while the mean value after management was (4.50 ± 0.39 mEq/L) .So potassium had no significantly decreased by 0.22%. The mean values of sodium before management was (140.92 ± 2.31 mEq/L) while the mean value after management was (141.53 ± 2.54 mEq/L) .So sodium had no significantly decreased by -0.43%. The mean values of calcium before management was (9.29 ± 0.46 mg/dL) while the mean value after management was (9.32 ± 0.45 mg/dL). So calcium had no significantly decreased by -0.32%.

Table (2): statistical analysis for measured parameters included in the study for both groups pre and post management:

	Group A		Group B		t – Value	p-Value
	Pre	Post	Pre	Post		
SBP(mmHg)	161.67 ± 7.91	122.33 ± 6.26	162.00 ± 7.14	131.33 ± 12.24	-3.585	0.001
DBP(mmHg)	103.67 ± 5.56	81.33 ± 6.29	103.33 ± 5.47	85.67 ± 8.17	-2.302	0.025
Potassium (mEq/L)	4.36 ± 0.43	4.38 ± 0.53	4.51 ± 0.68	4.50 ± 0.39	-1.013	0.315
Sodium (mEq/L)	140.61 ± 2.67	140.22 ± 2.49	140.92 ± 2.31	141.53 ± 2.54	-2.027	0.047
Calcium (mg/dL)	9.36 ± 0.46	9.28 ± 0.53	9.29 ± 0.46	9.32 ± 0.45	-0.353	0.725
					z- Value	p- Value
Serum creatinine (mg/dL)	3.12 ± 1.03	2.72 ± 1.03	3.65 ± 1.48	3.61 ± 1.45	-2.891	0.0048

SBP: systolic blood pressure

mmHg: millimeter mercury

mg/dL: Milligram/deciliter

DBP: diastolic blood pressure

mEq/L: milliequivalent per liter

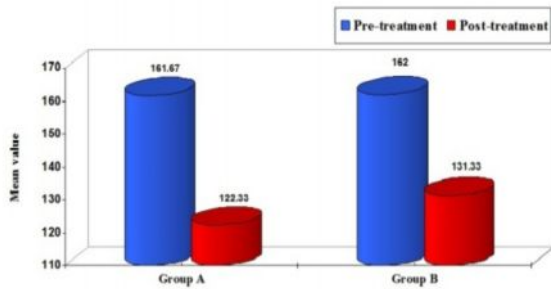


Fig.1: Comparison between mean values of SBP pre and post management between two groups.

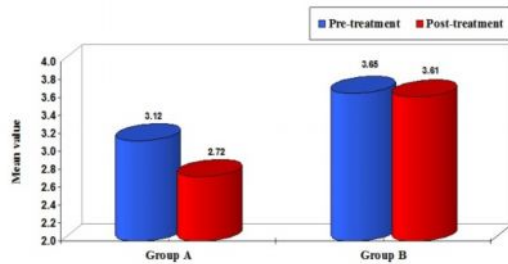


Fig.3: Comparison between mean values of serum creatinine pre and post management between two groups.

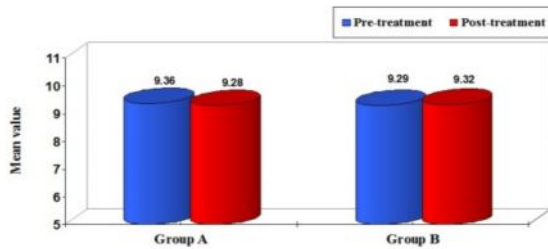


Fig.6: Comparison between mean values of calcium pre and post management between two groups.

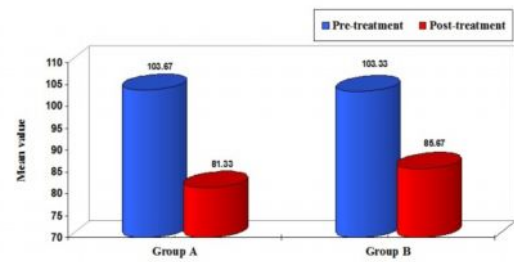


Fig.2: Comparison between mean values of DBP pre and post management between two groups.

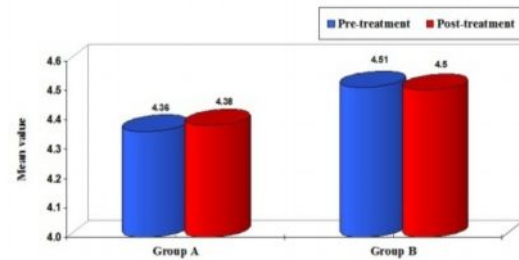


Fig.4 : Comparison between mean values of potassium pre and post management between two groups.

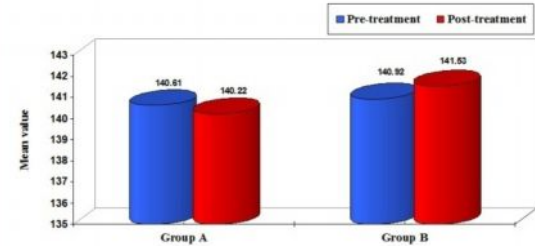


Fig.5: Comparison between mean values of sodium pre and post management between two groups.

Discussion

Hypertension is a common health problem in Egypt. It has a high prevalence, whereas its rates of awareness, treatment and control are low. In 60% of patients, hypertension is complicated by the presence of other cardiovascular risk factors, this adds to increased cardiovascular morbidity and mortality. Management of hypertension in Egypt is not easy because of treatment costs- a common cause of interruption of therapy-, inadequate physician training and inefficient primary health care system.⁽¹³⁾ Systematic reviews are cautious in saying that reflexology may exert a beneficial effect on lowering blood pressure⁽¹⁴⁾ and may have a positive impact on blood pressure¹⁵.

The results of this study were consistent with that of Lee,¹⁶ who did a study to examine the effects of foot reflexology on blood pressure of elderly essential hypertensive patients. The participants were consisted of 71 elderly patients with essential hypertension who received foot reflexology for 6 weeks. It concluded that foot reflexology had positive effects to decrease the blood pressure. This study also agreed with¹⁷ who did a study to determine effect of foot reflexology, as a non-pharmacological procedure, on systolic and diastolic blood pressures in patients with stroke. The blood pressure was significantly reduced among the experiment group after receiving the foot reflexology ($P < 0.05$). The mean systolic blood pressure was significantly reduced in the

experiment group after 10 and 30 minutes of massage; and the diastolic blood pressure was reduced significantly in all measured times ($P < 0.05$).

The results of the present study come in line with ¹⁸who did a study to investigate the effect of laser applied on acupuncture points on hypertension in obese patients. It was concluded that Laser had highly significant effect in reducing hypertension. These results were also consistent with that of ¹⁹who reported a study on 55 volunteers who treated with laser acupuncture. Significant changes in blood pressure after 12 weeks of treatment were reported.

There was shortage in article review discussing the role of reflexology and laser with kidney functions in details. ²⁰who did a study on 32 healthy young adults (17 women, 15 men). The treatment group received reflexology at zones corresponding to the right kidney. The placebo group received treatment on other foot zones. The two groups showed significant differences; a highly significant decrease showed during and following reflexology. Those results were consistent with the hypothesis that reflexology is effective in influencing renal blood flow and can significantly help kidney function.

Reflexology therapy significantly decreased SBP by 24.33% respectively, DBP by 21.55% respectively and serum creatinine by 12.82% respectively. While laser therapy significantly decreased only SBP by 18.93% respectively and DBP by 17.09% respectively. With statistical analysis of serum electrolytes, the results show that in group A, there was percent of change in K by -0.46% respectively, in Na by 0.28% respectively and in Ca by 0.85% respectively. While in group B, there was percent of change in K by 0.22% respectively, in Na by -0.43% respectively and in Ca by -0.32% respectively. Also, there was percent of change in creatinine by 1.10% respectively. Accordingly, the reflexology therapy is preferred because it is less cost, easier to be applied and available for patients as it can be done at home under supervision and by well-trained hands.

Conclusion:

It was concluded that reflexology therapy had an important role in improvement of hypertension and modulation of kidney functions. While Laser therapy had an effective response in management of blood pressure only.

References:

1. SPRINT Research Group (November 2015). A Randomized Trial of Intensive versus Standard Blood-Pressure Control. *N Engl J Med*. 2015 Nov 26;373(22):2103-16.
2. Cheung T. T. and Cheung B. M. Y. (2014). "Managing blood pressure control in Asian patients: safety and efficacy of losartan," *Clinical Interventions in Aging*, vol. 4, no. 9, pp. 443–450.
3. Nursing and Health Sciences (2014). 16, 126–130.
4. Gansevoort RT, Correa-Rotter R, Hemmelgarn BR, Jafar TH, Heerspink HJ, Mann JF. et al (2013). Chronic kidney disease and cardiovascular risk: epidemiology, mechanisms, and prevention. *Lancet*.; 382:339–52.
5. National Institute of Diabetes and Digestive and Kidney Diseases (2012) United States Renal Data System 2012 Annual Data Report: Volume 2: Atlas of End-Stage Renal Disease in the United States. Washington, D.C.: U.S. Government Printing Office;. Report.
6. Eckardt KU, Coresh J, Devuyst O, Johnson RJ, Kötting A, Levey AS. et al (2013). Evolving importance of kidney disease: from subspecialty to global health burden. *Lancet*.;382:158–69.
7. Abboud H, Henrich WL (2010). Clinical practice. Stage IV chronic kidney disease. *N Engl J Med*. ;362:56-65.
8. Error! Hyperlink reference not valid.
9. James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler K, Lackland DT, LeFevre M, MacKenzie TD, Ogedegbe O, Smith SC, Svetkey LP, Taler SJ, Townsend RR, Wright J, Narva AS, Ortiz E (2014). Evidence based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). *JAMA*;311(5):507-520

10. Goraya N, Simoni J, Jo CH, Wesson DE (2013) A comparison of treating metabolic acidosis in CKD stage 4 hypertensive kidney disease with fruits and vegetables or sodium bicarbonate. *Clin J Am SocNephrol* 8: 371-381.
11. Bjordal, J. M., Lopes-Martins R. A., Joensen, J., Couppe, C., Ljunggren, A. E., Stergioulas, A., Johnson, M. I. (2008). A systematic review with procedural assessments and meta-analysis of low level laser therapy in lateral elbow tendinopathy (tennis elbow). *BMC Musculoskelet. Disord.*, 9:75.
12. Hodgson N. A. and Lafferty D. (2012). "Reflexology versus Swedish massage to reduce physiologic stress and pain and improve mood in nursing home residents with cancer: a pilot trial," *Evidence-Based Complementary and Alternative Medicine*, vol. , Article ID 456897, 5 pages.
13. Mohsen Ibrahim (2013). Problem of hypertension in Egypt. *Egyptian Heart Journal*; 65(3):233–234.
14. Song HJ, Choi SM, Seo HJ, Lee H, Son H, Lee S. (2015). Self-administered foot reflexology for the management of chronic health conditions: a systematic review. *J Altern Complement Med.*, 21(2),69-76.
15. McCullough JE, Liddle SD, Sinclair M, Close C, Hughes CM. (2014). The physiological and biochemical outcomes associated with a reflexology treatment: a systematic review. *Evid Based Complement Alternat Med.*:502123.
16. Lee, Hyeon-Soon; Kim, Dong-Oak (2012). The effects of Aroma foot reflexology and foot reflexology on blood pressure, pulse rate and blood lipid level of elderly essential hypertensive patients in a rural area. *Journal of the Korea Academia-Industrial cooperation Society*, Volume 13, Issue 9, pp.4053-4064.
17. Pour AM, Dehnoalian A , Mojtabavi J (2013). Nursing care research, *Journal of hayat.Hayat*,19 (1) :16-28
18. Elmahy RM, Abdelhady AA, Hameid FA, Swify YS (2011). Response of hypertension to laser acupuncture in obese patients. Master thesis, faculty of physical therapy, Cairo University.
19. Zhang, J., Marquina, N., Oxinos, G. (2008). Effect of laser acupoint treatment on blood pressure and body weight-a pilot study. *J. Chiropr. Med.*, 7:134–139.
20. Sudmeier I et al.(1999). Changes of renal blood flow during organ-associated foot reflexology measured by colour Doppler sonography. *Forschende Komplementaermedizin* 6(3): 129-34 .
