



The effect of aloe vera phonophoresis on skin thickness in patients with psoriasis: a randomized controlled trail

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Abstract

Aim: The current study was conducted to evaluate the efficacy of aloe vera phonophoresis in the treatment of psoriasis. **Methods:** Thirty patients had psoriasis of the chronic plaque type, their ages ranged from 20-40 years. Patients were divided randomly into two equal groups. Group (A) received topical aloe vera that transmitted through the ultrasound, the ultrasound was delivered for 5 minutes with a frequency of 1 MHz, intensity of 1.5w/cm² with continuous mode, 3 sessions/week for two months as a total period of treatment. Group (B) received topical aloe vera once/day, massaged for 5 minutes, 3 times per week for two months as a total period of treatment. Method of evaluation was ultrasonography. **Results:** There was greater improvement in patients treated with aloe vera phonophoresis than those treated with topical aloe vera as evidenced by ultrasonography. **Conclusions:** The combination of ultrasound and aloe vera gel can be considered as an effective method to enhance the drug efficacy and penetration thus enhancing the treatment of psoriasis.

Keywords: aloe vera, phonophoresis, psoriasis treatment

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INTRODUCTION

Psoriasis is a long-term, non-communicable, painful, disfiguring and disabling disease that has no cure but has major adverse effect on the quality of life (QoL) of patients. It may happen at any time during life time (IHME 2010). At the same time that some surveys report that the mean age of onset for psoriasis was thirty three years old, and about seventy five percent of affection happened before forty six years old (Nevitt and Hutchinson 1996), others proposed that the attacking of psoriasis was bimodal with two peaks of the disease – the first is between (16 - 22) years of age and the second be between (57 - 60) years of age (Henseler and Christophers 1985). The reported prevalence of psoriasis in countries ranges between 0.09% (Gibbs et al. 1996) and 11.4% (Danielsen 2013), which making psoriasis a significant universal issue. A study of 2194 children in Egypt found that the prevalence of psoriasis among people 18 years of age and younger was 0.05% (Yamamah et al. 2012).

Psoriasis cause still unknown; however evidence refers for genetic predisposition (Harden et al. 2015). Studies proved that there is a significant role to the immune system in the psoriasis onset. Despite of the suggestion that psoriasis may be an autoimmune problem; no specific autoantigen has yet been described. Psoriasis may also be triggered by internal

and external factors, as mild injury, stresses, sunburn, infections, and systemic medications (Boehncke and Schön 2015).

Psoriasis affects the integumentary system and nails, causing many co-morbidities. Integumentary system affections may be generalized or localized, mainly symmetrical, sharply demarcated, erythematous papules and plaques, and frequently overlaid with white or silver scales; affection triggering itching, tingling and pain (WHO 2016). Between 1.3% (Bedi 1995) and 34.7% (Pariser et al. 2107) of patients with psoriasis get chronic, inflammatory arthritis (psoriatic arthritis) which cause disability and deformities of the joints (WHO 2016). Between 4.2% and 69% of all individuals affected by psoriasis get nail problems (Alshami 2010, Reich et al. 2009). Patients with psoriasis are proved to be at high risk of getting other significant illness as cardiovascular and other non-communicable diseases (NCDs) (Boehncke and Schön 2015, Augustin et al. 2015, Vena et al. 2010). Psoriasis causes great physical, emotional and social burden (Fuji et al. 2012, Kimball et al. 2005). Quality of life (QoL), in general, is often significantly impaired (De Korte et al. 2004, Augustin et al. 2008).

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Individuals with psoriasis usually face frequent challenges include: Disability, physical disfiguring, and sever loss of productivity (WHO 2016). There is also a serious price to mental wellness, such as increased rates of depression, causing negative effect for patients and community (Russo et al. 2004, Sampogna et al. 2012). Patients with psoriasis and their families are suffering from many psychological problems such as: inequality, social exclusion, and stigma (WHO 2016).

Aloe vera (AV) is a perennial, succulent, cactus-like plant belonging to the family Liliaceae. AV secretes a clear, mucilaginous gel possessing diverse putative pharmacological activities, including anti-inflammatory effects and is being used for various cosmetic and medicinal purposes (Choonhakarn et al. 2010).

Phonophoresis is the utilizing of ultrasound waves to improve the delivery of topical drugs by pushing it deeply into the skin. Drugs that administered by Phonophoresis can penetrate the skin much deeper than those massaged by using the hand on the skin surface (Akinbo et al. 2011, Gomaa et al. 2018, Mohamed and Ahmed 2019, Strigin, 2019).

SUBJECTS, MATERIALS AND METHODS

Subjects

This is a randomized controlled trail conducted on thirty patients had psoriasis of the chronic plaque type psoriasis. Patients were selected randomly from El Mataria Teaching Hospital (Department of Dermatology) then patients were divided randomly into two equal groups.

This controlled randomized trial was conducted to explore the effect of alo-vera phonophoresis in reducing skin thickness in patients suffer from chronic plaque type psoriasis. 30 Patients of both sexes (13 Male and 17 female) suffer from chronic plaque type psoriasis had met the inclusion and exclusion criteria so they were included in this study. Inclusion criteria include individuals of both sexes, age between (20-40) years old, subjects had mild to moderate degree of psoriasis (localized psoriasis). Individual who has one of the following criteria was excluded from the study: Pregnant women, Patients with any contraindication for aloe vera such as allergy, Patients with any contraindication for ultrasound (e.g.: acute infection or malignancy in the area to be treated), Patients who had history of diabetes or circulatory disorders. Patients were informed about measurement and treatment procedure, also about the aloe vera and ultrasonic device before beginning the treatment and every participant was asked to give their consent form. After the baseline assessment to each individual, participants were divided randomly into two equal groups using a concealed envelope that show the patient's group allocation. Group (A): this group was 15 patients (7 male & 8 female) with chronic plaque psoriasis. Patients in this group were treated by topical

aloe vera "100% pure aloe vera gel" which delivered by continuous ultrasound for 5 minutes/3 times per week + topical aloe vera once/ day (in the other days) for two months. Group (B): This group was 15 patients (6 male & 9 female) with chronic plaque psoriasis. They were treated by topical aloe vera "100% pure aloe vera gel" once/day, massaged for 5 minutes/3 times per week for two months. Patients in both groups did not receive any other treatment as corticosteroids and they were instructed to follow their dermatologist instructions.

Methods of Evaluation

Primary medical examination was done to every participant to get a complete medical picture of the health status of him/her and to determine if the individual was able to participate in the study or if there were any contraindications. Personal data including (age, sex, & skin thickness) were collected from every patient before the beginning of the study. Skin thickness of the affected area was measured again after finishing of the study (post-treatment).

Measurements were performed under standardized conditions in respect to that:

- Measurements were done every time by the same evaluator.
- All measurements were given as the median of 3 recording to prevent assessment errors.
- The same area was measured every time by determining it in relation to a fixed landmark.
- Thickness of the ultrasound coupling gel layer was adjusted about 1mm to ensure standardization.
- The patients were given 10 min. to adapt to room conditions and this is the same for all patients.
- Measurements were always carried out while patient in a good proper comfortable position.

Skin thickness assessment

40 MHz Ultrasound imaging system was used to measure skin thickness at the affected area in relation to a fixed point. This point was determined in relation to a certain landmark (e.g.: the landmark used for thigh was greater trochanter, for leg was patella, for foot was medial and lateral malleolus, for the arm was acromion, for the forearm was olecranon, for the hand was radial or the ulnar styloid process and for the back was spinus processes). Measurements were taken pre-treatment and post-treatment (after 2 months), for all patients in both groups.

Treatment Procedure

All patients in both groups (A) and (B) received the same topical aloe vera "100% pure aloe vera gel" once/day. All Patients were asked to follow dermatologist instructions also they were asked to avoid psoriasis predisposing factors as malnutrition and psychological stresses as possible. All patients in the both groups did not receive any other treatment as corticosteroids.

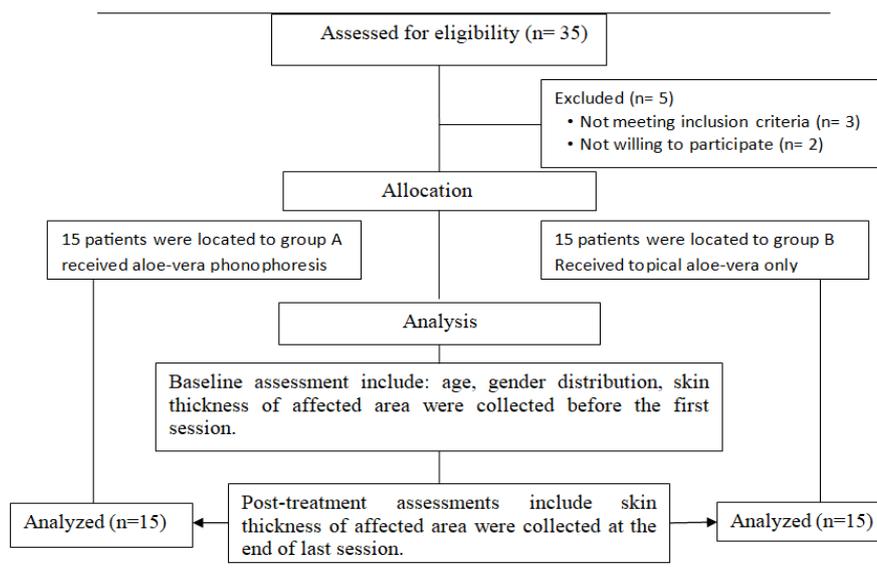


Fig. 1. A diagram of participants’ selection and randomization during the experimental trial

Group A: phonophoresis group

This group was 15 patients (7 male & 8 female) with chronic plaque psoriasis. They received topical aloe vera “100% pure aloe vera gel manufactured in United States of America (U.S.A) by fruit of the earth europe limited (FOTE europe LTD)” that transmitted through the ultrasound + topical aloe vera once/ day (in the other days). The Ultrasound was delivered for 5 min with a frequency of 1 MHz, intensity equals 1.5 w/cm² with continuous mode, 3 sessions per week for two months (Loyd and Allen 2005).

Group (B): Control group

This group was 15 patients (6 male & 9 female) with chronic plaque psoriasis. They received topical aloe vera “100% pure aloe vera gel” once/day, massaged for 5 minutes/3 times per week for two months.

STATISTICAL ANALYSIS

In this study, the descriptive statistics (the mean and the standard deviation) was calculated for all subjects in both groups of the study to determine the homogeneity of the groups pre-treatment. Comparisons were made by student’s t-test to compare the variables between all groups of the study. Paired t- test was used to compare before and after treatment in the same group. It was considered statistically significant when a value of p ≤0.05.

RESULTS

A diagram of participants’ selection and randomization during the experimental trial is demonstrated in **Fig. 1**. At the beginning, 35 individual with chronic psoriasis were evaluated. Only 30 volunteers were found to be eligible to join this study. Totally, 30 (100%) participants were included in the

Table 1. Patient demographic data in both groups

General characteristics	Group A (N=15)		Group B (N=15)		Comparison		Level of significance
	Mean ± SD	Mean ± SD	T value	P value	T value	P value	
Age	30.33 ± 5.24	30.46 ± 4.13	0.07	0.93			NS
Skin thickness	0.74 ± 0.05	0.73 ± 0.07	0.45	0.656			NS
Variables	distribution	distribution	Chi-value	P-value			Level of significance
Gender disruption	7 M. 8 F.	6 M. 9 F.	0.13	0.713			NS

A = phonophoresis group, B = topical aloe-Vera, P-value = probability level, NS = non-significant.

Results of patients (pre and post treatment) in each group: Results post treatment revealed a statistically significant (P<0.01) decrease in skin thickness of affected area for each group (table 2).

Table 2. Skin thickness pre and post treatment in each group. N = 15 for each group.

Variables	Group (A) (mean±SD)	Significant (P-value)	Group (B) (mean±SD)	Significant (P-value)
thickness of skin	Pre 0.74 ± 0.05	0.0001*	Pre 0.73 ± 0.07	0.0001*
	post 0.45 ± 0.05		post 0.59 ± 0.06	

A = phonophoresis group, B = topical aloe-Vera, P-value = probability level.

pretreatment assessment, and 30 (100%) participants completed the study and were assessed in post-treatment evaluation.

Demographic and Clinical Characteristic of Patients Pre-treatment

The demographic characteristics of the patients are shown in **Table 1**. In the treatment baseline there were no significant differences in mean values of age, thickness of the skin between the two groups of the trial.

Comparing the Results of Both Groups Post Treatment

Comparing the results of both groups post treatment are shown in **Table 3**, and it is revealed that group (A) was statistically significant decrease (P<0.05) in skin thickness of affected area than group (B).

Table 3. Comparing skin folds thickness post treatment for both groups

Variables	Groups (N=15 for each group)		Mean \pm SD	T-value	P-value	Significant (P-value)
	A	B				
Skin thickness	A		0.45 \pm 0.05	6.94	0.0001	HS
	B		0.59 \pm 0.06			

A = phonophoresis group, B = topical aloe-Vera, P-value = probability level.

DISCUSSION

Psoriasis is not a life-threatening disease, but it cause a sever level of morbidities as patients feel shy from their appearance. As well as, many serious psychosocial problems affecting those individuals; usually they face stigmatization, inequality and social isolation. Additionally, patients suffer from psoriasis have reduced levels of hiring and earning as well as a reduced life quality (Horn et al. 2007).

Also there are several co-morbidities that have been linked to psoriasis including the metabolic syndrome such as obesity, dyslipidemia and diabetes. Psoriasis may also happen with inflammatory bowel illness and human immunodeficiency disease (Wolf et al. 2008).

The combined costs of the disease's long term treatment and social expenses have a significant effect on health care systems and on society in general (Nestle et al. 2005).

So this experimental trail was carried out to determine the efficacy of aloe-vera phonophoresis on skin thickness in patients with chronic psoriasis as Aloe vera has an anti-inflammatory effect and it is reported that its inhibitory effect on the arachidonic acid pathway may be due to cyclooxygenase (Duansak et al. 2003).

The results of this study show that there was an improvement after treatment for the both groups but with different percentages; phonophoresis group had a percentage of improvement of 40 % per skin thickness after 8 weeks of treatment application (post-treatment) compared with pretreatment values of the same group. While the percentage of improvement to the skin thickness in group B (control group) was 20 % after 8 weeks of treatment application (post-treatment) compared with pretreatment values. Also the results of this study showed a significant difference between both groups after 2 months of treatment with *p* value equals 0.0001 in favor to group (A) which proved the efficacy of aloe vera phonophoresis in the treatment of psoriasis.

The demonstrated improvement can be claimed to be caused by the therapeutic action of phonophoresis, which increase the skin absorption to many topical medications as local anesthetics and anti-inflammatory steroids from intact precutaneous tissues to the deep subcutaneous layers by ultrasound waves, so increasing their effectiveness (Yueh-Ling 2006).

The main positive effect of phonophoresis is the introduction of pharmacological agents to a local area with no invasion of the skin. Also the homogenous interaction between ultrasound and drugs is one of the Phonophoresis advantages (Vranic 2004).

As well as, Phonophoresis provides the desire effect of pain free, safe and easy penetration of topical drugs to the deep components within the integumentary system (Goraj-Szczybiorowska et al. 2007).

So phonophoresis is a form of combination therapy that implicate both the therapeutic effects of ultrasound and enhancing the drug therapy efficacy in the treatment simultaneously, making this combination more effective than each therapy alone (Srbely 2008).

The results of this study concerning the effect of aloe vera phonophoresis in patient with psoriasis confirmed the observations of: (Antonio 2010, Barbara 2003, Cagnie et al. 2003, Meshali et al. 2008, Naik et al. 2000, Ter-Haar 2007, Yang et al. 2006, Yueh-Ling 2006).

CONCLUSION

Within the limitations of the study, the most notable conclusion is that the combination of ultrasound and aloe vera gel can be considered as an effective therapy to improve the penetration of topical medications thus increasing its effectiveness in the treatment of psoriasis lesion.

RECOMMENDATIONS

It is recommended to add aloe vera phonophoresis with to routine management of psoriasis patients.

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REFERENCES

- Akinbo S, Owoeye O, Adesegun S (2011) Comparison of the therapeutic efficacy of diclofenac sodium and methyl salicylate phonophoresis in the management of knee osteoarthritis. *Turk. J. Rheumatol* 26(2): 111-119.
- Alshami MA (2010) Clinical profile of psoriasis in Yemen, a 4-year retrospective study of 241 patients. *J Eur Acad Dermatol Venereol* 24(4): 14.
- Antonio L, Antonio B, Egberto M, Fla'vio A Regiane A (2010) Comparative study of the topical application of aloe vera gel, therapeutic ultrasound and phonophoresis on the tissue repair in collagenase-induced rat tendinitis. *Ultrasound in Med. and Biol* 36 (10): 1682-1690.

- Augustin M, Krüger K, Radtke MA, Schiwipl I, Reich K (2008) Disease severity, quality of life and health care in plaque-type psoriasis: a multicenter cross-sectional study in Germany. *Dermatology* 216(4): 366–72.
- Augustin M, Radtke MA, Glaeske G, Reich K, Christophers E, Schaefer I et al. (2015) Epidemiology and Comorbidity in Children with Psoriasis and Atopic Eczema. *Dermatology* 231(1): 35–40.
- Barbara C (2003) Phonophoresis versus topical application of ketoprofen: comparison between tissue and plasma level. *Phys. Ther* 7: 349-356.
- Bedi TR (1995) Clinical profile of psoriasis in North India. *Indian J Dermatol Venereol Leprol* 61(4): 202–5.
- Boehncke W-H, Schön MP (2015) Psoriasis. *Lancet* 386(9997): 983–94.
- Cagnie B, Elke V, Steven R Guy Vanderstraeten (2003) Phonophoresis versus topical application of ketoprofen: comparison between tissue and plasma levels. *Phys. Ther* 83: 707-712.
- Choonhakarn C, Busaracome P, Sripanidkulchai B, Sarakarn PA (2010) prospective, randomized clinical trial comparing topical aloe vera with 0.1% triamcinolone acetonide in mild to moderate plaque psoriasis. *J. Eur. Acad. Dermatol* 24: 168-172.
- Danielsen K, Olsen AO, Wilsgaard T, Furberg AS (2013) Is the prevalence of psoriasis increasing? A 30-year follow-up of a population-based cohort. *Br J Dermatol* 168: 1303–10.
- De Korte J, Sprangers MA, Mommers FM, Bos JD (2004) Quality of life in patients with psoriasis: a systematic literature review. *J Investig Dermatol Symp Proc* 9(2): 140–7.
- Duansak D, Somboonwong J, Patumraj S (2003) Effects of aloe vera on leukocyte adhesion and TNF-a and IL-6 levels in burn wounded rats. *Clin. Hemorheol. Microcirc* 29: 239-246.
- Fuji R, Mould JF J, Tang B, Brandt H, Pomerantz D, Chapnick J et al. (2012) Burden of disease in patients with diagnosed psoriasis in Brazil: results from 2011 national health and wellness survey (NHWS). *Value Health* 15(4): A107.
- Gibbs S (1996) Skin disease and socioeconomic conditions in rural Africa: Tanzania. *Int J Dermatol* 35(9): 633–9.
- Gomaa EGA, Berghout MA, Moustafa MR, El Taweel FM, Farid HM (2018) Thermodynamic and Theoretical solvation parameters for 2-amino-4, 5-dimethylthiophene-3-carboxamide (ADTC) in Ethanol and Mixed EtOH-H₂O solvents. *Progress in Chemical and Biochemical Research* 1(1, pp. 1-80): 19-28.
- Goraj-Szczypiorowska B, Zajac L, Skalska-Izdebska R (2007) Evaluation of factors influencing the quality and efficacy of ultrasound and phonophoresis treatment. *Ortop. Traumatol. Rehabil* 9 (5): 449-458.
- Harden JL, Krueger JG, Bowcock AM (2015) the immunogenetics of psoriasis: a comprehensive review. *J Autoimmun* 64: 66–73.
- Henseler T, Christophers E (1985) Psoriasis of early and late onset: characterization of two types of psoriasis vulgaris. *J Am Acad Dermatol* 13(3): 450–6.
- Horn E, Elizabeth J, Jennifer C (2007) Psoriasis affects daily activities. *National Psoriasis Foundation* 2:1-5.
- Institute for Health Metrics and Evaluation (IHME) (2010) Global Burden of Disease Study Results by Cause 1990–2010. Seattle: IHME.
- Kimball AB, Jacobson C, Weiss S, Vreeland MG, Wu Y (2005) The psychosocial burden of psoriasis. *Am J Clin Dermatol* 6(6):383–92.
- Loyd V, Allen J (2005) Compounding for phonophoresis. *Secundum Artem* 1(11): 10- 17.
- Meshali M, Abdel-Aleem H, Sakr F (2008) In vitro phonophoresis: effect of ultrasound intensity and mode at high frequency on NSAIDs transport across cellulose and rabbit skin membranes. *Pharmazie* 63 (1): 49-53.
- Mohamed HSH, Ahmed SA (2019) Reviewing of Synthesis and Computational Studies of Pyrazolo Pyrimidine Derivatives. *Journal of Chemical Reviews* 1(3. pp. 154-251): 183-232.
- Naik A, Kalia Y, Guy R (2000) Transdermal drug delivery: overcoming the skin's barrier function. *PSTT* 3 (9): 318-326.
- Nestle F, Conrad C, Tun-Kyi A, Homey B, Gombert M, Boyman O, Burg G, Liu Y, Gilliet M (2005) Plasmacytoid predendritic cells initiate psoriasis through interferon-alpha production. *J. Exp. Med* 202(1): 135-143.
- Nevitt GJ, Hutchinson PE (1996) Psoriasis in the community: prevalence, severity and patients' beliefs and attitudes towards the disease. *Br J Dermatol* 135(4): 533–7.
- Pariser D, Schenkel B, Carter C, Farahi K, Brown TM, Ellis CN and Psoriasis Patient Interview Study Group (2017) A multicenter, non-interventional study to evaluate patient-reported experiences of living with psoriasis. *Indian Dermatol Online J* (6): 454-459.

- Reich K, Krüger K, Mössner R, Augustin M (2009) Epidemiology and clinical pattern of psoriatic arthritis in Germany: a prospective interdisciplinary epidemiological study of 1511 patients with plaque-type psoriasis. *Br J Dermatol* 160(5):1040–7.
- Russo PAJ, Ilchef R, Cooper AJ (2004) Psychiatric morbidity in psoriasis: a review. *Australas J Dermatol* 45(3): 155–9.
- Sampogna F, Tabolli S, Abeni D (2012) Multipurpose Psoriasis Research on Vital Experiences (IMPROVE) investigators. Living with psoriasis: prevalence of shame, anger, worry, and problems in daily activities and social life. *Acta Derm Venereol* 92(3): 299–303.
- Srbely S (2008) Ultrasound in the management of osteoarthritis: part I: a review of the current literature. *JCCA. J. Can. Chiropr. Assoc* 52(1): 30-37.
- Strigin MB (2019) World Conscience. Model of a Social Crystal. *Journal of Environmental Treatment Techniques* 7(4): 647-653.
- Ter-Haar G (2007) Therapeutic applications of ultrasound. *Progress in Biophysics and Molecular Biology* 93: 111-129.
- Vena GA, Altomare G, Ayala F, Berardesca E, Calzavara-Pinton P, Chimenti S et al. (2010) Incidence of psoriasis and association with comorbidities in Italy: a 5-year observational study from a national primary care database. *Eur J Dermatol* 20(5): 593–8.
- Vranic E (2004) Sonophoresis-mechanisms and application. *Bosn. J. Basic Med. Sci* 4(2): 25-32.
- Wolf N, Quaranta M, Prescott N, Allen M, Smith R, Burden A, Worthington J, Griffiths C, Mathew C, Barker J, Capon F, Trembath F (2008) Psoriasis is associated with pleiotropic susceptibility loci identified in type II diabetes and crohn disease. *J. Med. Genet* 45(2): 114-116.
- World Health Organization (WHO) (2016) Global report on PSORIASIS, ISBN 978 92 4 156518 9. available on the WHO website (www.who.int)
- Yamamah GA, Emam HM, Abdelhamid MF, Elsaie ML, Shehata H, Farid T et al. (2012) Epidemiologic study of dermatologic disorders among children in South Sinai, Egypt. *Int J Dermatol* 51(10):1180–5.
- Yang J, Kim D, Yum M, Kim T, Shin S (2006) Trans-dermal delivery system of triamcinolone acetonide from a gel using phonophoresis. *Arch. Pharm. Res* 29 (5): 412-417.
- Yueh-Ling H (2006) Effects of ultrasound and diclofenac phonophoresis on inflammatory pain relief: suppression of inducible nitric oxide synthase in arthritic rats. *Phys. Ther* 5: 110-121.