

Efficacy and Safety of Intralesional Injection of Tuberculin PPD in Treatment of Plantar Warts

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Abstract

Background: Many destructive and immunotherapeutic modalities have been used for the management of plantar warts; however, an optimal treatment with high efficacy and absent or low recurrence has not been explored to date. Tuberculin purified protein derivative (PPD) shown promising results for treatment of viral warts without ablation.

Aim of Study: To evaluate the efficacy and safety of intralesional (IL) PPD in the treatment of plantar warts.

Patients and Methods: Twenty patients with plantar warts were included in this study and divided into two equal groups; group I was treated using IL tuberculin PPD every 2 weeks, group II was treated with IL saline every 2 weeks, till complete clearance or for a maximum of 3 sessions. The patients were followed-up for a period of 6 months.

Results: There was a statistically highly significant improvement in the therapeutic group compared with control group. This modality was well tolerated, with no remarkable side effects and no recurrence in cured patients during follow up period. A significant positive correlation existed between the number of sessions and treatment response. There was a significant negative correlation between the number of lesions and response to treatment.

Conclusion: Intralesional PPD is safe and effective treatment alternative for the treatment of plantar warts even if they are recalcitrant or multiple, with no post-procedural downtime and better results and patient satisfaction.

Key Words: *Intralesional immunotherapy – Purified protein derivative – Warts.*

Introduction

WARTS are benign proliferation of skin and mucosa caused by the human papillomavirus (HPV) that usually appear on the hands and feet [1]. Warts in people who are immunocompetent are harmless and usually resolve spontaneously within months or years owing to natural immunity. However there

is considerable social stigma associated with warts on the face and hands, and they can be painful on the soles of the feet and near the nails. Accordingly, many patients request treatment for their warts [2].

Although several modalities have been developed for the treatment of warts, a universally effective approach has not been explored to date. Warts are usually treated by traditional destructive modalities as cryotherapy, electrocoagulation, topical salicylic acid and laser surgery [3,4]. All of these therapeutic modalities can be painful, time consuming, and/or expensive [5-7].

The role of immunity is crucial for the development of the disease and typically related to cell-mediated immune response [5]. Immunotherapy appears to enhance recognition of the virus by the immune system which allows clearance of the treated warts and sometimes warts at distant sites, thus protecting against future recurrence through induction of a long-term immunity to HPV [8,9]. Immunotherapeutic agents used for treatment of warts include oral levamisole, cimetidine and zinc sulfate [10].

A new approach of intralesional (IL) immunotherapy has been developed for treatments of warts and included IL injections of tuberculin purified protein derivative (PPD); measles, mumps, and rubella (MMR) vaccine; Mycobacterium w(Mw) vaccine and Candida albicans antigen. While the mechanisms of vaccine and antigen therapy have not been fully understood, it is thought that the host immune system is activated to recognize the virus, leading to wart clearance [11-13]. The aim of this work was to evaluate the efficacy and safety of intralesional protein derivative (PPD) in the treatment of plantar warts.

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Patients and Methods

Patients:

The current study included 20 patients complaining of plantar warts diagnosed clinically on the basis of typical appearance of skin lesions and confirmed by dermoscopic examination. The patients were collected from the Outpatient Clinic of Dermatology and Venereology Department, Tanta University Hospitals from December 2016 to December 2017. Patients representing both gender and different age groups.

The studied patients were classified randomly into two groups:

- Group I: Included 10 patients treated by IL PPD.
- Group II [control group]: Included 10 patients treated by IL placebo (saline).

Pregnant, lactating, patients with cognitive impairment or unrealistic patients that may preclude study compliance and patients with epileptic seizures were excluded.

Methods:

All the studied patients were assessed clinically and dermoscopically, treated by IL PPD in group I and saline in group II. The dermoscopy used in this study was (Dermlite II PRO HR (3 Gen, USA). It is a palm-sized and offers high light output, a large 25mm, 10 x lenses, camera adaptability as well as an integrated rechargeable lithium ion battery. This dermoscopy combines the advantages of polarized and immersion fluid dermoscopy. To facilitate the use of immersion fluid, the unit is equipped with a retractable faceplate spacer. Concerning the light intensity, a push button is used to toggle between two light intensity settings. The first mode activates 16 light-emitting diodes and the second activates 32 light-emitting diodes. Patients in group I received IL 0.3ml of PPD (TU/0.1) and group II received 0.3ml of saline. Patients were injected into the base of the largest wart and the injection was repeated into the same wart at 2-week intervals for a maximum of 3 sessions. The wart was injected using a one mL U-100 insulin syringe. The syringe was held parallel to the skin surface, and the needle was injected with the bevel facing upward. All patients were assessed every session and followed up monthly for 6 months after the end of treatment sessions to assess any recurrence or side effects.

The treatment efficacy was evaluated by three physicians committee, digital image analysis, dermoscopic evaluation and Clinical efficacy was categorized by this score: [14]

- *Complete (excellent) response:* (Appearance of normal skin).
- *Partial response:* (More than 50% reduction in size).
- *Minimal response:* (Less than 50% reduction in size).
- *No response:* Stable disease.

Also, Safety and tolerability were assessed by reporting any complaint or skin changes, whether observed by the investigator or the patients.

Results

Clinical results:

As regard age: In group I, it ranged from 15-35 years with a mean \pm SD 23.20 \pm 6.98, in group II, it ranged from 20-45 years with mean \pm SD 26.10 \pm 7.21. There was no significant difference between the studied groups as regard age (Table 1).

As regard gender: Group I, composed of 7 males (70%) and 3 females (30%), group II, included 4 males (40%) and 6 females (60%). There was no significant difference between the studied groups as regard gender (Table 1).

All the patients under the study were represented with single or multiple plantar warts. As regard number of lesions: In group I, 6 patients (60%) complained from single warts and 4 patients (40%) from multiple warts while in group II, 7 patients (70%) complained from single warts and 3 (30%) patients from multiple warts. There was no significant difference in the studied groups as regard the number of lesions but patients with single lesion were higher than those represented with multiple lesions in all groups (Table 1).

As regard the duration of warts: In group I, the duration ranged from 1-12 months with a mean \pm SD 6.52 \pm 4.14 while in group II, the duration ranged from 1-18 months with a mean \pm SD 7.34 \pm 4.95. There was no significant difference between the studied groups as regard duration of warts (Table 1).

As regard number of sessions and response to treatment:

In group I treated with IL PPD, 5 patients (50%) have shown complete recovery in the target lesion. This response has been achieved in 3 patients (30%) after 3 sessions. However, 2 patients (20%) have shown same response with only 2 sessions of treatment and one patient (10%) has shown partial response while 2 patients (20%) have shown minimal response and 2 patients (20%) didn't show any noticeable improvement after the 3 sessions

of treatment. The patients in group II that were injected with normal saline as a control didn't show any signs for improvement throughout the study.

Table (1): Age and gender distribution of the patients in the studied groups.

	Group I (No=10) No. (%)	Group II (No=10) No. (%)	<i>p</i>
<i>Age in years:</i>			
Mean ± S.D	23.20±6.98	26.10±7.21	0.553
Range	15-35	20-45	
<i>Gender:</i>			
Male	7 (70%)	4 (40%)	0.528
Female	3 (30%)	6 (60%)	

Number and durations of the lesions among patients of the studied groups.

Characteristics	Group I (No=10) No. (%)	Group II (No=10) No. (%)	<i>p</i>
<i>Number of lesions:</i>			
Single	6 (60%)	7 (70%)	0.074
Multiple	4 (40%)	3 (30%)	
<i>Duration (months)</i>			
Range/month	1-12	1-18	0.455
(Mean ± S.D)	6.52±4.14	7.34±4.95	

Table (2): Clinical response after 3 treatment sessions in the studied groups.

	Group I (No=10)	Group II (No=10)	<i>p</i> -value
<i>Response to treatment after 3 sessions:</i>			
Excellent response/recovery	5 (50%)	0 (0%)	<0.001**
Partial response	1 (10%)	0 (0%)	<0.005*
Minimal response	2 (20%)	0 (0%)	<0.001**
No response/poor improvement	2 (20%)	0 (0%)	<0.001**

*Significant, *p*-value <0.005. **Highly significant *p*<0.001.

Table (3): Number of sessions required for complete response.

	Group I (No=10)	Group II (No=10)	<i>p</i> -value
<i>No. of sessions required for complete response:</i>			
1	0 (0%)	0 (0%)	<0.05*
2	1 (10%)	0 (0%)	<0.001**
3	4 (40%)	0 (0%)	<0.001**

*Significant, *p*-value <0.005. **Highly significant *p*<0.001.

Dermoscopic evaluation:

As regard black to red dots and globules: In group I it was detected in 7 patients (70%) before treatment and in one patient (10%) after treatment. In group II, it was detected in 8 patients (80%) without change after treatment. As regard papilliform surface: in group I, it was detected in 10 patients (100%) before treatment and 5 patients (50%) after treatment. In group II, it was detected

in 10 patients (100%) without change after treatment. As regard interrupted skin lines: In group I it was detected in 10 patients (100%) before treatment and 5 patients (50%) after treatment. In group II, it was detected in 10 patients (100%) without change after treatment. There was a statistically highly significant decline as regard black to red dots and globules, papilliform surface and interrupted skin lines before and after treatment in group I compared with control group (Table 4).

As regard side effects associated with the injection in group I, it showed that one patient (10%) developed hyperpigmentation whereas 5 patients (50%) experienced flue like symptoms within 24 hours of the injection, while 7 patients (70%) temporarily experienced painful sensation for 24 hrs that was relieved by analgesics, only 4 patients (40%) showed transient signs for erythematous edema which relived by cold compression pads. By the end of the study, none of the patients of complete recovery showed any sign of scar.

For group II, no side effects were reported upon injection of saline into these patients (Table 5).

Table (4): Comparison of the dermoscopic findings before and after treatment in the studied groups.

Dermoscopic findings	Group I No=10 %		<i>p</i> value	<i>p</i> -value	Group II No=10 %		<i>p</i> -value
<i>Black to red dots and globules:</i>							
Before	7	70	<0.001**	<0.05*	8	80	1
After	1	10			8	80	
<i>Papilliform surface:</i>							
Before	10	100	<0.01**	<0.001**	10	100	1
After	5	50			10	100	
<i>Interrupted skin lines:</i>							
Before	10	100	<0.01*	<0.001*	10	100	1
After	5	50			10	100	

*Significant, *p*-value <0.005. **Highly significant *p*<0.001.

Table (5): Reported side effects of the treatment in the studied groups.

Side effects	Group I (No=10) (%)	Group II (No=10) (%)	<i>p</i> -value
<i>Hyperpigmentation:</i>			
Absent	9 (90%)	10 (100%)	0.821
Present	1 (10%)	0 (0%)	
<i>Flue like symptoms:</i>			
Absent	5 (50%)	10 (100%)	0.042*
Present	5 (50%)	0 (0%)	
<i>Pain:</i>			
Absent	3 (30%)	10 (100%)	0.021*
Present	7 (70%)	0 (0%)	
<i>Erythematous edema:</i>			
Absent	6 (60%)	10 (100%)	0.074
Present	4 (40%)	0 (0%)	

*Significant significant *p*<0.05.

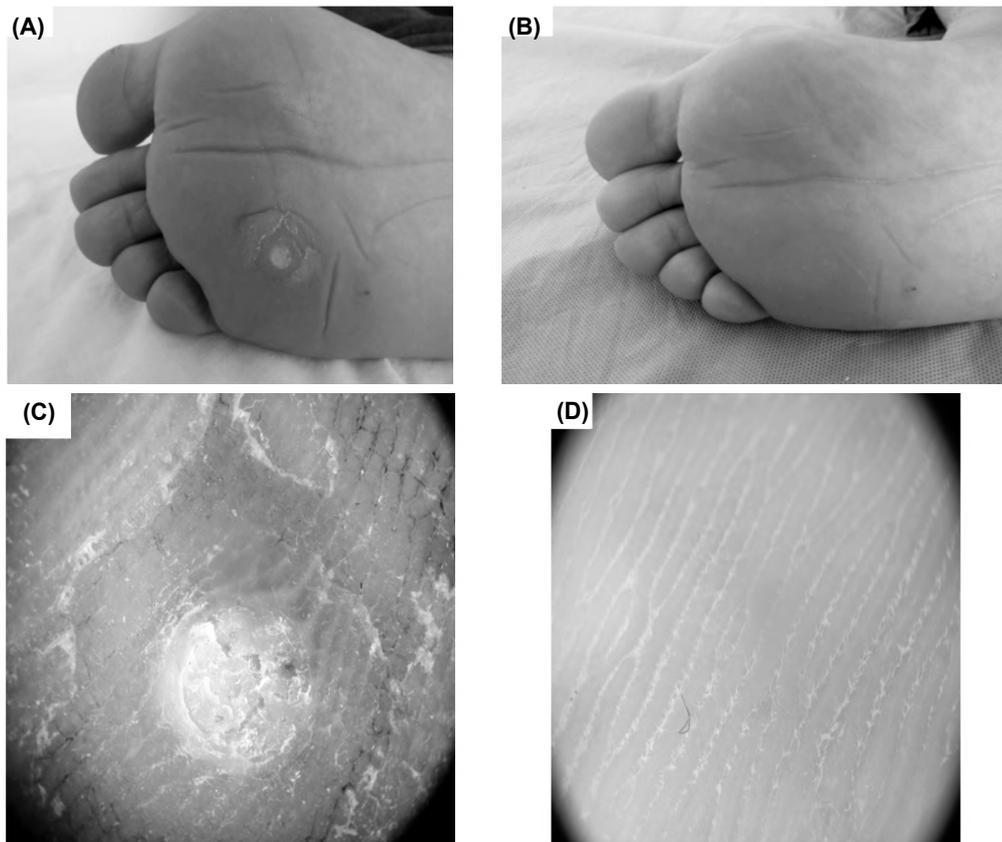


Fig. (1): (A): Male patient aged 20 years with a single plantar wart before treatment. (B): The same patient after 3 sessions of IL PPD with excellent response. (C): Dermoscopic picture of the same patient before treatment showing interrupted skin lines and papilliform surface. (D): Dermoscopic picture of the same patient showing disappearance of previous findings and return of normal skin lines after treatment.

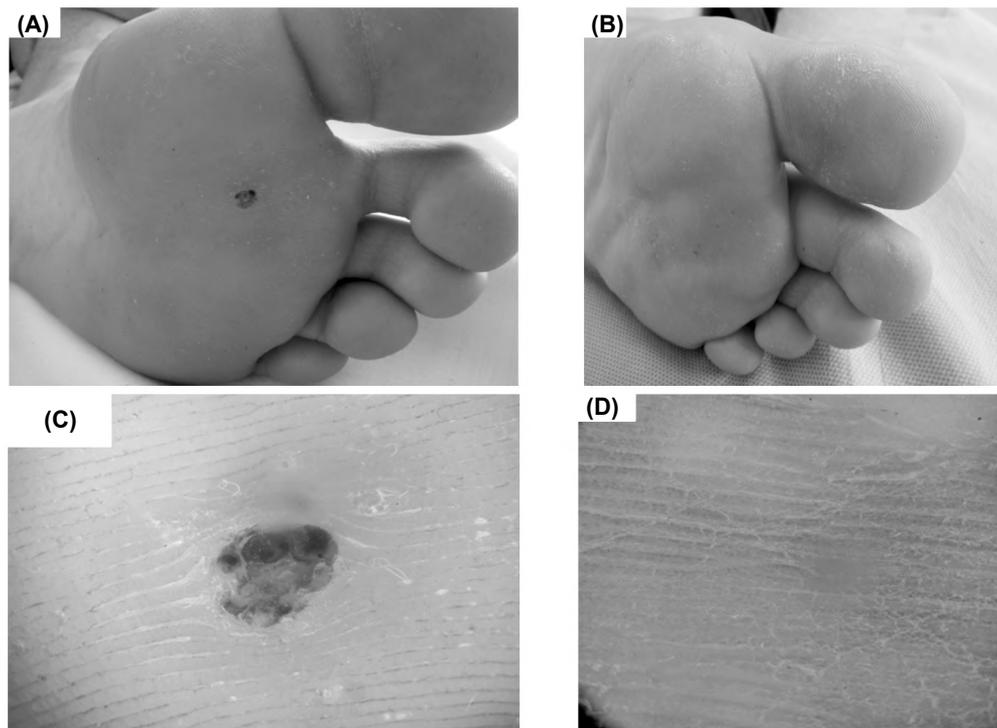


Fig. (2): (A): Male patient aged 23 years with a single plantar wart before treatment. (B): The same patient after 3 sessions of IL PPD with excellent response. (C): Dermoscopic picture of the same patient before treatment showing interrupted skin lines, red and black dots and papilliform surface. (D): Dermoscopic picture of the same patient showing disappearance of previous findings and return of normal skin lines after treatment.

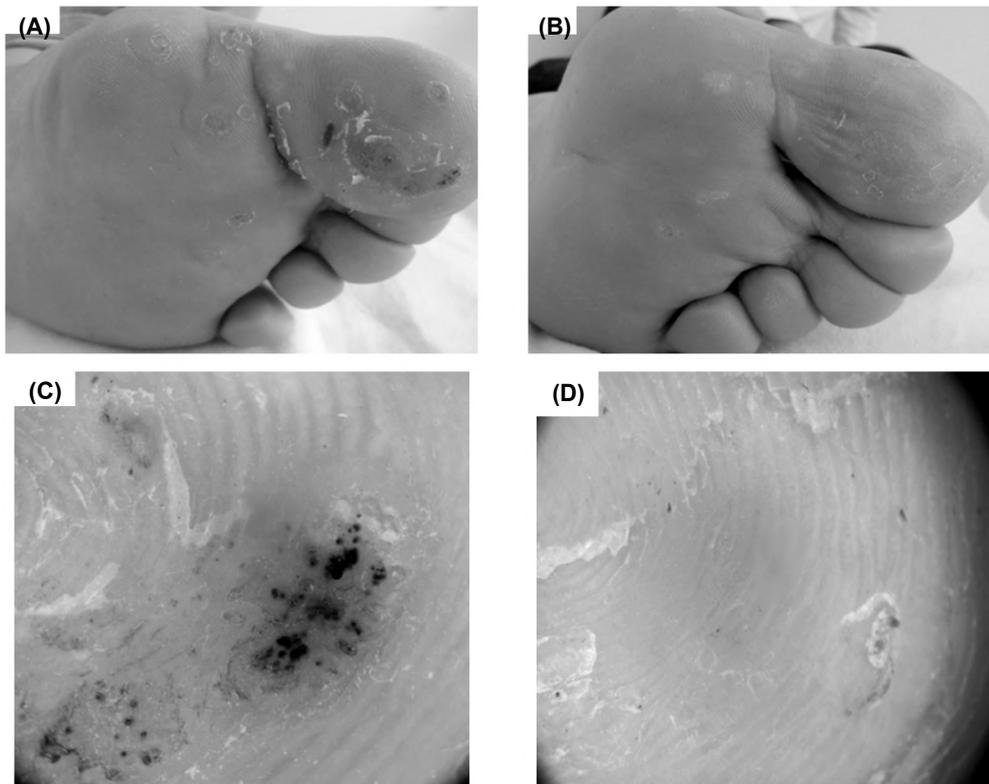


Fig. (3): (A): Male patient aged 35 years with multiple plantar warts before. (B): The same patient after 3 sessions of IL PPD with partial response. (C): Dermoscopic picture of the same patient before treatment showing interrupted skin lines, red and black dots and papilliform surface. (D): Dermoscopic picture of the same patient showing disappearance of black and red dots and remaining of interrupted skin lines and papilliform surface after treatment.

Discussion

In group I, we tested the effectiveness of IL tuberculin PPD in the treatment plantar warts. Complete clearance of lesions was seen in 50% of patients, this response has been achieved in 3 patients (30%) after 3 sessions. However, 2 patients (20%) have shown same complete response with only 2 sessions of treatment. Only one patient (10%) has shown partial response while 2 patients (20%) have shown minimal response and 2 patients (20%) didn't show any noticeable improvement after the 3 sessions of treatment. This was tested by previous studies Nimbalkar et al., 2016 [15] which had a different cure rate from the current study may be due to large number of patients and more sessions in their study, Saoji et al., 2016 [16], in which the cure rate seems to be higher from the current study due to the use of IL injections in multiple lesions and higher quantity of tuberculin PPD injected while our results were similar to the study by Shaheen et al., 2015 [17].

Although the underlying mechanisms have not yet been fully explained, there is increasing evidence that cell mediated immunity plays an important role in the resolution of human warts. Injection

of tuberculin PPD stimulates cell mediated immunity non-specifically through activation of Th1 cytokines, natural killer cells and cytotoxic T lymphocytes and reported to be effective against all types of warts such as verruca plana, verruca vulgaris and plantar warts irrespective of the serotype of human papilloma virus [18]. It has been also reported that injection of tuberculin PPD not only stimulates the local immunity but also leads to circulation of activated T cells in the body leading to clearance of injected as well as non-injected distant warts. As PPD is a protein derivative and does not contain any viable organisms, it can be used safely in children and pregnant women [19].

Intralesional immunotherapy seems to enhance recognition of the virus by the immune system. This, in turn, prevent future clinical infection through induction of a long-term acquired immunity to human papilloma virus, leading to a prominent decrease in the recurrence rates which represent an important promising advantage of IL antigen immunotherapy [20].

The clearance of untreated warts was an important advantage of PPD reported in our study

and it has also been reported by other studies utilizing IL antigen injection for the treatment of different types of warts: (tuberculin PPD) [20], (Mumps, Candida or Trichophyton alone or in combination) [21], (killed mycobacterium vaccine) [22]. This strongly indicates the development of a widespread cell mediated immunity against human papilloma virus as a response to antigen injection; an observation that represents a highly promising advantage of IL antigen immunotherapy, including PPD over traditional therapies [22].

The results of the present study and similar related studies revealed partial or no response in some of the studied patients, the underlying cause of which is unclear. Many factors may explain the difference in response between the studied patients, including the sensitivity degree to the injected antigen, the number, type, size, duration and resistance of warts, the age and sex of the patients, level and function of toll like receptors, difference in the degree of HLA presentation of processed antigen, difference in the distribution and function of APCs and difference in the immune cell response to the processed antigen [20].

In the present study, there was no significant correlation between response to treatment and patients' age and sex or duration of lesion. This was the same as reported in a study by Nimbalkar et al., 2016 [15]. However, the study done by Elela et al., on 2011 has reported that the response is better with older age and this response is affected by the duration of the lesions, the longer the duration, the less the response to PPD [15].

There was a negative correlation between the number of lesions and the response to treatment which was statistically significant. These findings suggest that PPD seems to be more effective in patients with single lesion than those with multiple lesions or needs to be injected in each individual wart. This is different from previous studies [17,20].

There was a positive statistically significant correlation between the number of sessions and the response to treatment in this study which suggests that patient's response may be enhanced by increasing the number of sessions this was the same in other previous studies [15,16].

As regard dermoscopic evaluation, 7 patients (70%) showed black to red dots and glonbules and 10 (100%) showed papilliform surface and interrupted skin lines, these lesions were diagnosed as viral warts. After treatment only one (10%) showed black to red dots and 5 (50%) showed papilliform surface and interrupted skin lines. The use of

dermoscopy is able to determine more correctly whether or not further treatment is needed as reported before in a previous study [23].

Side effects noted in the present study were minimal and not very serious. They included hyperpigmentation seen only in one patient (10%) which disappeared spontaneously during follow up period, in contrast to a previous study where postinflammatory hyperpigmentation was seen in 8 patients which resolved by applying depigmenting agent [15]. Flue like symptoms were seen in 5 patients (50%) which was controlled by analgesics and this is consistent with a study conducted by Johnson et al., 2001 which showed that 36.1% of patients have experienced these symptoms for 24 hours after injection. Pain was seen in 3 patients (30%) which was transient and controlled by anesthesia before injection and erythematous edema seen in 6 patients (60%) which is considered the most common side effect and was best controlled by cold compress over sole after injection. This was the same as reported by Saoji et al., 2016 [16].

No recurrence was reported in our study in 6 months follow-up period. This was constant with previous studies [15,25].

In group II, we tested the effectiveness of IL saline in the treatment of plantar warts. A dose of 0.3ml of saline was IL injected into the base of the largest wart and the injection was repeated into the same wart at 2-week intervals for a maximum of 3 sessions. From these 10 patients, no one showed any response.

Intralesional saline is generally used as the placebo control for the treatment of warts. Shaheen et al., 2015 administered IL saline as a placebo in wart patients with 0% success rate which agreed with the current study [17]. There was a statistically highly significant improvement in therapeutic group compared with the control group. The clinical response in the target warts was complete recovery 50%, partial response 10%, and minimal response 20%. While lack of clinical response has been observed in 100% of patients in control group.

References

- 1- STERLING J. and KURTZ J.B.: Viral infections. In: Champion RH, Burton JL, Burns D.A., Breathnach S.M., eds. Rook textbook of dermatology. Oxford: Blackwell Scientific, pp. 598-623, 2016.
- 2- LIPKE M.M.: An armamentarium of wart treatments. Clin. Med. Res., 4: 273-93, 2006.
- 3- LICHON V. and KHACHEMOUNE A.: Plantar warts: A focus on treatment modalities. Dermatol. Nurs., 19: 372-5, 2007.

- 4- OCKENFELS H.M. and HAMMES S.: Laser treatment of warts. *Hautarzt*, 59: 116-23, 2008.
- 5- ALGHAMDI K.M. and KHURRAM H.: Successful treatment of plantar warts with very diluted bleomycin using a translesional multipuncture technique: Pilot prospective study. *J. Cutan Med. Surg.*, 16: 250-6, 2012.
- 6- KIMURA U., TAKEUCHI K., KINOSHITA A., TAKAMORI K. and SUGA Y.: Long-pulsed 1064-nm neodymium: Yttrium-aluminum garnet laser treatment for refractory warts on hands and feet. *J. Dermatol.*, 41: 252-7, 2014.
- 7- EL-MOHAMADY A.S., MEARAG I., EL-KHALAWANY M., ELSHAHED A., SHOKEIR H. and MAHMOUD A.: Pulsed dye laser versus Nd:YAG laser in the treatment of plantar warts: A comparative study. *Lasers Med. Sci.*, 29: 1111-6, 2014.
- 8- KUS S., ERGUN T., GUN D. and AKIN O.: Intralesional tuberculin for treatment of refractory warts. *J. Eur. Acad. Dermatol. Venereol.*, 19: 515-6, 2005.
- 9- CLIFTON M.M., JOHNSON S.M., ROBERSON P.K., KINCANNON J. and HORN T.D.: Immunotherapy for recalcitrant warts in children using intralesional mumps or Candida antigens. *Pediatr. Dermatol.*, 20: 268-71, 2003.
- 10- CHOI M.H., SEO S.H., KIM I.H. and SON S.W.: Comparative study on the sustained efficacy of diphenylprone immunotherapy versus cryotherapy in viral warts. *Pediatr. Dermatol.*, 25: 3989, 2008.
- 11- LEE J.Y., KIM C.W. and KIM S. S.: Preliminary study of intralesional bleomycin injection for the treatment of genital warts. *Ann. Dermatol.*, 27: 239-41, 2015.
- 12- AWAL G. and KAUR S.: Therapeutic outcome of intralesional immunotherapy in cutaneous warts using the mumps, measles and rubella vaccine. *J. Clin. Aesthet. Dermatol.*, 11 (5): 15-20, 2018.
- 13- GUNDETI M.S., REDDY R.G. and MURALIDHAR J.V.: Subcutaneous intralesional Ksharodaka injection: A novel treatment for the management of warts: A case series. *J. Ayurveda Integr. Med.*, 32 (6): 420-3, 2014.
- 14- GAMIL H., ELGHARIB I., NOFAL A. and ABD ELAZIZ T.: Intralesional immunotherapy of plantar warts: Report of a new antigen combination. *J. Am. Acad. Dermatol.*, 63: 40-3, 2010.
- 15- NIMBALKAR A., PANDE S., SHARMA R. and BORKAR M.: Tuberculin purified protein derivative immunotherapy in the treatment of viral warts. *Indian J. Dermatol.*, 2: 19-23, 2016.
- 16- SAOJI V., LADE N.R., GADEGONE R. and BHAT A.: Immunotherapy using purified protein derivative in the treatment of warts: An open uncontrolled trial. *Indian J. Dermatol. Venereol. Leprol.*, 82: 42-6, 2016.
- 17- SHAHEEN M.A., SALEM S.A.M., FOUAD D.A. and EL FATAH A.A.: Intralesional tuberculin (PPD) versus measles, mumps, rubella (MMR) vaccine in treatment of multiple warts: A comparative clinical and immunological study. *Dermatol. Ther.*, 28:194-200, 2015.
- 18- ELELA I.M., ELSHAHID A.R. and MOSBEH A.S.: Intradermal vs intralesional purified protein derivatives in treatment of warts. *Gulf J. Dermatol. Venereol.*, 18: 21-6, 2011.
- 19- EASSA B.I., ABOU-BAKR A.A. and EL-KHALAWANY M.A.: Intradermal injection of PPD as a novel approach of immunotherapy in anogenital warts in pregnant women. *Dermatol. Ther.*, 24: 137-43, 2011.
- 20- SANTOS LÓPEZ G., MÁRQUEZ DOMÍNGUEZ L., REYES LEYVA J. and VALLEJO RUIZ V.: General aspects of structure, classification and replication of human papillomavirus. *Rev. Médica Inst Mex Seguro Soc.*, 53 (Suppl 2): S166-71, 2015.
- 21- NOFAL A., NOFAL E., YOSEF A. and NOFAL H.: Treatment of recalcitrant warts with intralesional measles, mumps, and rubella vaccine: A promising approach. *Int. J. Dermatol.*, 54: 667-71, 2015.
- 22- GUPTA S., MALHOTRA A.K., VERMA K.K. and SHARMA V.K.: Intralesional immunotherapy with killed mycobacterium w vaccine for the treatment of anogenital warts: An open label pilot study. *J. Eur. Acad. Dermatol. Venereol.*, 22: 1089-93, 2008.
- 23- LEE D.Y., PARK J.H., LEE J.H., YANG J.M. and LEE E.S.: The use of dermoscopy for diagnosis of plantar wart. *J. Eur. Acad. Dermatol. Venereol.*, 23 (6): 726-7, 2009.
- 24- JOHNSON S.M., ROBERSON P.K. and HORN T.D.: Intralesional injection of mumps or candida skin test antigens: A novel immunotherapy for warts. *Arch. Dermatol.*, 137: 451-5, 2001.
- 25- WANANUKUL S., CHATPROEDPRAI S. and KITTIRATSACHA P.: Intralesional immunotherapy using tuberculin PPD in the treatment of palmoplantar and perungual warts. *Asian Biome*, 3: 739-43, 2009.

فعالية وأمان الحقن الموضعي للمشتق البروتيني المنقى للتوبركولين (السليين) في علاج ثآليل باطن القدم

عادة ما تكون الثآليل الأخمصية مقاومة للعلاج، ويلزم إجراء جلسات علاج متعددة لإزالتها بشكل كامل وغالباً ما يتم علاج الثآليل بالطرق التدميرية التقليدية وقد تم تطوير نهج جديد من العلاج داخل الثآليل يشمل ب ب د، لقاح الحصبة والنكاف والحصبة الألمانية، لقاح الكنديدا. في حين أن آليات اللقاح والعلاج بالأجسام المضادة لم تكن مفهومة تماماً، ولكنه يعتقد أنه يتم تنشيط الجهاز المناعي المضيف للتعرف على الفيروس، مما يؤدي إلى إزالته وهذا النهج العلاجي معروف بالعلاج المناعي.

الهدف من البحث: تقييم فعالية وسلامة حقن المشتق البروتيني المنقى للتوبركولين (ب ب د) في الثآليل.

المرضى وطرق البحث: شملت الدراسة الحالية ٣٠ مريضاً يعانون من ثآليل باطن القدم تم اختيارهم من العيادات الخارجية للأمراض الجلدية والتناسلية بالمستشفيات الجامعية بطنطا في الفترة من ديسمبر ٢٠١٦ إلى ديسمبر ٢٠١٧.

النتائج: أظهر ٥ مرضى (٥٠٪) الشفاء التام في نفس التؤلؤل الذي تم حقنه ولم يكن هناك اختلافاً ذا دلالة إحصائية بين الاستجابة للعلاج وسن المريض أو مدة الثآليل في جميع المجموعات. بينما كان هناك علاقة بين عدد لثآليل وعدد الجلسات والاستجابة للعلاج. لم تكشف متابعة المرضى بعد ٦ أشهر أى تكرار.

الاستنتاج: أظهر حقن ب ب د فعالية وقابلية في معالجة الثآليل والتخلص منها بدون تكرار.