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HIGH FREQUENCY ULTRASOUND IN THERAPY EFFECT ASSESSMENT OF FLUOCINOLONE ACETONIDE IN PATIENTS WITH PSORIASIS VULGARIS

SUMMARY

In the prospective study, the modification of ultrasound characteristics of psoriatic plaques during fluocinolone acetonide treatment was examined. The investigation included 25 patients with chronic plaque-type psoriasis to whom fluocinolone acetonide was applied on the psoriatic lesions once a day in the period of 14 days. Lesions were evaluated before therapy, and after 7 and 14 days of topical treatment with fluocinolone acetonide. For ultrasound measurement, the apparatus used was Dermascan C of 20MHz ultrasound frequency, 0,05mm axial resolution, 0,3mm lateral resolution, 13mm scanning depth. Ultrasonographic skin scanning visualizes acoustic tomograms which can be qualitatively and quantitatively analyzed. With the combined application of A- and B- modus echography, we measured the thickness of the enter echo, the width of subepidermal hypo-echogenic band under the enter echo and entire skin on the beforehand determined localities, after which the therapy results were compared. The results of the investigation indicated a significant regression of lesions, which was verified by ultrasound parameters. The size of the enter echo was reduced to 72% of the initial value. The dimensions of the hypo-echogenic band were reduced to 47% of the value before the therapy, and the skin thickness fell to 72% of the value measured before the therapy commencement. The conclusion is that high frequency ultrasound can be used as an objective method for monitoring and more precise assessment of therapy effect of various medications in dermatology.

Key words: **psoriasis vulgaris, ultrasound, fluocinolone acetonide**

INTRODUCTION

Psoriasis vulgaris is a chronic, genetically determined, inflammatory and proliferative skin disease, with prevalence of 1-3% in the general population. Clinical expression and the progress of disease are unpredictable, with periods of remission and exacerbation of different duration (1-4). Today, in most of the cases, psoriasis is cured with a systemic therapy, local application of medicines, photochemotherapy and the combination of these methods. Treatment of stable plaque psoriasis includes topical use of keratolytics, tar preparations, topical corticosteroids, topical or oral retinoids, vitamin D analogues, dithranol and phototherapy (3-6).

Fluocinolone acetonide belongs to the group of synthetic, fluoridated corticosteroids for local application. Being liposoluble, it penetrates through the skin and shows strong anti-inflammatory effects. Applied to a psoriatic lesion, it leads to fast regression of inflammation and more efficient elimination of scales. The assessment of the therapeutic efficiency until now has mostly been done on the basis of subjective, visual impression of the doctor in charge of

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the treatment. The success of the therapy is determined by: infiltration reduction, erythema, and desquamation. The objectivisation of therapeutic effects is also possible with a noninvasive diagnostic method, ultrasonographic check-up of the psoriatic lesions (5, 7,9).

B-modus 20-MHz ultrasonography is a noninvasive, accessory diagnostic method which visualizes acoustic tomograms of pathological changes of the soft tissue. Its use in dermatology allows for fast and simple obtaining of echograms of normal or pathologically changed epidermal and dermal structures by recording ultrasound reflexions (10-12). On the echogram of healthy skin the following can be noticed: enter echo which correlates with the thickness of epidermis, but due to reflexion and refraction of ultrasound waves on the way from the probe to the skin it does not reflect absolutely correct epidermis thickness. Derm is the next structure which is visualized on the echogram of normal skin. Derm echogenity depends on the connective tissue net structure, so all pathological changes on this level lead to reflexion reduction. Subcutaneous fat tissue is normally poorly reflective, with the exception of connecting septa which are echogenous. The borders between enter echo and derm, and between derm and subdermal fat tissue are usually clear.

Psoriatic lesions which are the subject of this research show certain echogram characteristics which are conditioned by paraketarosis, acanthosis, edema, and non-specific cellular infiltrate in papillary dermis. Non-treated psoriatic plaque shows a strong enter echo, often combined with focal dorsal acoustic shadows. It has been shown histologically that they correspond to the zones of paraketarosis. Underneath, there is a hypo-echogenic band parallel with the skin surface which is easily discerned by irregularly distributed inside echos. This weakly echogen band represents an acanthotic epithel and an inflammatory cellular infiltrate. The below-lying derm is of conciderably reduced echogenity (10-16).

The investigation was conducted with the aim to monitor the modification dynamics of ultrasonographic parameters of psoriatic plaques during fluocinolone acetonide treatment.

MATERIAL AND METHODS

The examination was performed on 25 patients, aged 25-56 yaers, with clinically verified psoriasis vulgaris en plaque diagnosis. In the period of 14 days, once a day, fluocinolone acetonide was applied to their lesions.The examination excluded: pregnant and breastfeeding women, patients with acute, arthropatic, erythrodermal or pustular psoriasis, patients with psoriatic lesions on the face, genitals, intertriginous regions, patiens with severe chronical and malignant diseases, patients who were previously on the local treatment less than 4 weeks, and patients inappropriate for cooperation. The lesions were measured before the 7^{th} and 14^{th} day since the therapy commencement. For ultrasound diagnostics, the apparatus Dermascan C (Cortex Tehnology ApS, Hadsund, Danmark) was used, of 20MHz ultrasound frequency, axial resolution 0,05mm, lateral resolution 0,3mm, scanning depth 13mm.

By scanning the skin lesions, B (brightness mode) scans are produced, and by their computer processing, A (amplitude mode) scans. Applying combined A- and B- modus echography, the thickness of enter echo that conditionally correlates with the epidermis thickness, the width of hypo-echogenic band below the enter echo and entire skin on the predetermined locations were measured and the values obtained during the treatment were compared.

RESULTS

Echograms done during the first visit showed the thickness of enter echo of 0.28mm, measured on changes found on metacarpus, up to 0.52mm on the knees. With all observed psoriatic lesions under the enter echo, there was a hypo-echogenic band parallel with the surface of the skin, of 0.23mm to 0.49mm thickness, while the thickness of the skin, depending on the lesion expression, ranged from 3.37mm to 5.72mm *(Table 1)*.

During fluocinolon acetonide treatment, in the first week of the therapy the thickness of the enter echo was reduced – in the range of 0.23mm up to 0.46mm, which was 87% of the innitial value. After 14 days of local fluocinolone acetonide therapy, the thickness of enter echo was further decreased, the values varying between 0.18mm to 0.37mm, or 72%. The dimensions of the hypo-echogenic band were also changed. From the innital, average value that was 0.38mm, in the first week of the therapy, the thickness is lowered to 0.28mm, or 74% of the value prior to the therapy. After two weeks of the terapy, the thickness was lowered to 0.18mm, or 47% of the value prior to the therapy. In two patients, it could not be ultrasonographicly detected at all. The thickness of the skin, measured at the first (zero) examination, had the average value of 4.58mm; in the first week of the therapy, it shows a significant decrease which is 85% of the innitial value, and after the second week of the treatment, 72% of the value before the beginning of the therapy.

DISCUSSION

Even today, psoriasis stands for a therapy problem (3, 4, 6). Potent fluorinated corticosteroids, like fluoninolone acetonide, are frequently used in

Table 1. The modification of ultrasound characteristics of psoriatic plaques during fluocinolone acetonide treatment

Ordinal number	Dimension of enter echo (in mm)			Dimension of hypo-echogenic band (in mm)			Skin thickness (in mm)		
	0	7.	14.	0	7.	14.	0	7.	14.
	days of therapy			days of therapy			days of therapy		
1.	0.28	0.23	0.18	0.36	0.22	0.15	3.66	3.05	2.71
2.	0.29	0.24	0.20	0.32	0.25	0.19	3.56	3.01	2.63
3.	0.34	0.30	0.20	0.30	0.19	0.13	5.25	4.40	3.80
4.	0.31	0.26	0.19	0.26	0.17	/	5.62	4.52	3.91
5.	0.44	0.38	0.32	0.31	0.25	0.18	5.52	4.31	3.62
6.	0.42	0.37	0.31	0.44	0.35	0.20	4.85	3.81	3.00
7.	0.39	0.32	0.28	0.49	0.37	0.28	4.23	3.50	2.92
8.	0.52	0.44	0.31	0.48	0.32	0.28	3.82	2.90	2.54
9.	0.46	0.40	0.34	0.42	0.30	0.20	4.37	3.60	2.91
10.	0.49	0.40	0.37	0.46	0.33	0.19	3.93	3.50	2.69
11.	0.41	0.36	0.34	0.49	0.39	0.27	4.81	4.25	3.71
12.	0.29	0.26	0.21	0.33	0.26	0.11	4.01	3.55	2.90
13.	0.50	0.44	0.37	0.49	0.32	0.25	4.57	3.70	3.10
14.	0.44	0.40	0.36	0.38	0.26	0.17	5.32	4.73	3.90
15.	0.49	0.41	0.37	0.36	0.26	0.15	3.37	3.01	2.61
16.	0.29	0.23	0.22	0.40	0.32	0.22	5.25	4.65	3.82
17.	0.32	0.27	0.26	0.35	0.27	0.19	4.75	4.22	3.60
18.	0.51	0.46	0.35	0.41	0.35	0.25	4.52	4.11	3.54
19.	0.52	0.45	0.33	0.43	0.32	0.24	3.95	3.30	2.80
20.	0.38	0.33	0.28	0.40	0.31	0.20	5.72	4.84	4.51
21.	0.40	0.36	0.30	0.38	0.29	0.19	5.38	4.62	3.80
22.	0.42	0.38	0.31	0.36	0.31	0.21	4.65	4.22	3.71
23.	0.28	0.25	0.23	0.32	0.26	0.10	4.72	4.11	3.59
24.	0.34	0.30	0.28	0.28	0.24	0.17	4.91	4.32	3.50
25.	0.29	0.25	0.20	0.23	0.19	/	3.85	3.32	2.80

the local therapy of stationary plaque psoriasis. Although they lead to the therapy response, they carry the risk of adverse effects (5, 7-9). The estimation of therapy effect is mostly done on the basis of subjective, visual impression of the doctor in charge of the treatment. Even with strictly defined criteria on the basis of which the scoring of clinical parameters is done (erythema, induration, desquamation, itch), it is impossible to eliminate the subjectivity of an assessment like this. Pathohistology, dermoscopy, and ultrasonographic skin examination allow more objective recognition of the therapy effects.

Psoriatic lesions have certain echogram characteristics conditioned by paraketarosis, akantosis, and non-specific cellular infiltrate in papillary dermis. Non-treated psoriatic plaque shows strong enter echo, often combined with focal dorsal acoustic shadows. It has been histologically proved that they correspond to the zones of paraketarosis. Hypo-echogenic band lies below parallel with the surface of the skin. This weakly-echogenic band represents an akantotic epithel and inflammatory cellular infiltrate and it shows disease activity. The below-lying dermis is of significantly decreased echogenicity (11, 12, 14).

During controlled and time-limited preparations' application, constantly notifying modifications of acoustic tomograms of treated psoriatic plaques, it is possible to obtain objective indicators of therapy effects. The results we obtained during the two-week monitoring of ultrasound parameters of psoriatic plaques treated with fluocinolone acetonide showed significant decrease of enter echo thickness, which is, at least partially, the result of hyperkeratosis decrease. The change in the thickness of hypoechogen band occured due to the decrease of akantosis, that is cellular infiltrate and edema in the papular derm, which led to the decrease of the entire thickness of the skin as well.

CONCLUSION

Although ultrasonography is a relatively new diagnostic method, it slowly takes its place, not

only in experimental but also in practical dermatology. Noninvasive examination of longitudinal acoustic tomograms of psoriatic plaques in chronical psoriasis, and the possibility of registering their modification offer objective information on the dynamics of pathological processes and their regression during the local therapy.

Precise determination of ultrasound parameters of the epiderm and derm and the possibility of registering their modification in a shorter or longer time interval can be used for monitoring and objective assessment of the medication therapy effect. Ultrasound examination does not have a resolution of a histological finding, but gives precise information on the skin microstructure, with directly accessible findings obtained in vivo. Moreover, it should be emphasised that this method is entirely harmless and painless for a patient, and can be, if needed, repeated many times.

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VISOKOFREKVENTNI ULTRAZVUK U PROCENI TERAPIJSKOG EFEKTA FLUOCINOLON ACETONIDA KOD OBOLELIH OD PSORIASIS VULGARIS

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SAŽETAK

U prospektivnoj studiji praćena je modifikacija ultrazvučnih karakteristika psorijatičnih plakova u toku lečenja fluocinolonacetonidom. Ispitivanjem je bilo obuhvaćeno 25 pacijenata sa klinički verifikovanom dijagnozom psoriasis vulgaris en plaque, kojima je na psorijatične promene jedanput dnevno aplikovan fluocinolonacetonid, u periodu od 14 dana. Promene su merene pre 7-og i 14-og dana od početka terapije. Za ultrazvučnu dijagnostiku korišćen je aparat Dermascan C, sa frekvencom ultrazvuka od 20MHz, aksijalne rezolucije 0,05mm; lateralne rezolucije 0,3mm; dubine skeniranja 13mm. Ultrasonografskim skeniranjem kože vizuelizuju se akustični tomogrami koje je moguće kvalitativno i kvantitativno analizirati. Kombinovanom primenom A- i

B- modusne ehografije merili smo debljinu ulaznog eha, širinu hipoehogene trakaste senke ispod ulaznog eha i čitave kože na unapred određenim lokalizacijama i upoređivali dobijene vrednosti tokom terapije. Rezultati ispitivanja pokazali su značajnu regresiju promena koja je verifkovana ultrazvučnim parametrima. Veličina ulaznog eha smanjena je na 72% od početne vrednosti. Dimenzije hipoehogene trake smanjene su na 47% od vrednosti pre terapije, a debljina kože na 72% od vrednosti merene pre početka terapije. Zaključak je da se ultrazvuk visoke frekvence može koristiti kao objektivna metoda za praćenje i uspešniju procenu terapijskog učinka različitih medikamenata u dermatologiji.

Ključne reči: **psoriasis vulgaris, ultrazvuk, fluocinolonacetonid**