77 - UTILIZATION OF ULTRAVIOLET RADIATION IN PSORIASIS TREATMENT: A CASE STUDY

Priscila Correia Gonçalves dos Santos; Maria Goretti Fernandes ; Ana Luiza Soares de Araújo
Faculdade Integrada do Recife - RIF [Recife Integrated College]
fisio100@yahoo.com.br

INTRODUCTION AND JUSTIFICATION

Psoriasis is an inflammatory, recurrent, chronic dermatosis, related to the genetic transmission (ELDER, NAIR and VOORHEES, 1994), with phases of standstills and returns, with no precise chronology (AZULAY and AZULAY, 1999). It is relatively frequent, it affects of 1.5 to 2% of the world-wide population (RUIZ et al, 2003). Plate psoriasis is the most common type for this illness, occurring in more than 80% of the cases, with thick pinkish and redish plates, acutely demarcated and covered with silverish scales, whereas the guttata type occurs approximately in 10% of the patients (LOW and REED, 2001 and BIONDI et al apud Lebwohl, 2003).

During psoriasis' pathogeny there occurs an increase in cellular proliferation, one marked shortening of turnover on the epidermis of the psoriatic injury. The increase in the synthesis of DNA in the psoriatic epidermis remains even after the inflammation is abolished (SAMPAIO and RIVITTI, 2001). The histological markers of psoriasis include differentiation and abnormal hyperploriferation of queratinocites, infiltration of inflammatory cells and vascular proliferation. The cellular cycle of the queratinocite is reduced from 311 to 36h in psoriasis and the transitory time of the queratinocite in the epidermis diminishes from 27 to 4 days. (OTTONNE apud Ashcroft et al, 2000).

The ultraviolet radiation (UV) has been used as a immunossupressor therapy in a variety of illnesses (AUBIN and MOUSSON, 2004). The artificial phototherapy widely used in psoriasis, either by means of ultraviolet B of radiation (UVB), or ultraviolet A radiation (UVA) the latter associated with photosensibilizant agents. The action of both involves the induction of immunomodulating effects, inhibiting the cellular replicancy and leading to local and systemic immunosupression. In psoriasis, as much epidermic queratinocites as cutaneous linfocites can be a target for the UV. The immunosuppression, alteration of the cytocine, expresses how much the interrupted cellular cycle can contribute for the suppression of pathological activity in psoriatic injuries (JEANMOUGIN, 1999; VALLAT et al, 1994 and HÖNIGSMANN, 2001). Since psoriasis is an illness that causes dermofunctional alterations, it it can be treated by the physiotherapist who together with the doctor will act in the tegumentary recovery. As a physiotherapic resource we can use UVB and UVA radiations (ultraviolet a, long waves between 315 and 400nm) (LOW and REED, 2001). The artificial production of UV radiation will be managed through mercury light bulbs of medium pressure. Being the patient submitted to the Saidman test in order to verify the minimum erythema dose (MED), thus determining the first dose of UV, based on cutaneous reaction (AGNE, 2004) and the following sessions will follow the protocol of the sequential therapy according to FERREIRA (2003).

The study by Araújo (2004) notes that psoriasis carriers submitted to ultraviolet radiation obtained a reduction of injuries with improvement of the scalling off and rashes. The application time of UV radiation can influence in the process of the patient's recovery, however the treatment mustn't be extended, due to the long term effects caused by UV radiation, unless there is good evidence that its interruption will lead to a new development of the psoriasis (LOW and REED, 2001), with this in mind in this present study we suggest to verify the psoriasis therapeutical evolution, throughout 20 sessions, using the technique of modified sequential therapy, observing alterations in the pigmentation and scalling off and quantifying the response through the use of the paquimeter in order to evaluate the reduction of the psoriatic injuries, of its length as well as its width, through a case report.

METHODOLOGY

This study it was carried through in the Clinical School of Physiotherapy from the Integrated College of Recife (CEFISIO-FIR), during the period of July to November 2005. It is an expermental study of case report type. It involves a female patient aged 45, psoriasis carrier the plate type since approximately 3 years ago who did not made use of medicine for the treatment. She was lead by her dermatologist to CEFISIO-FIR, where she has been evaluated and it received information on the research, signing the term of free and conscious assent according to the resolution 196/96CNS.

As a criteria of inclusion for the research, we included the psoriasis carrier, plate or drop type, with lesions present in the trunk or extremities. Having as criterion of exclusion from the research, a genetic predisposition to the development of skin cancer, a history of cancer, acute hypersensitivity to solar light, acute forms of eczema, lupus erythematosus and simple herpes.

Before the beginning of the treatment, an dermo-functional evaluation was carried through, where each lesion to be radiated was to be measured by a paquimeter of Tramontina brand of 0.05 mm accuracy. In order to survey the size of the lesions with the paquimeter, we used as reference points the biggest length and the biggest width of the lesion. For the analysis intergroups it was used the non-parametric Wilcoxon test and for the analysis among the groups it was used a non-parametric Mann-Whitney test. All of the conclusions taken to significance level of 5%.

Initially the patient was submitted to a Saidman test, for an evaluation of the minimum erythema dose (MED), where the patient was to be laid in dorsal decubitus, with the anterior part of one of the arms (sensible area for the test), undressed, both the therapist and the participant were using specific eyeglasses for protection. The ultraviolet light bulb (UVA and UVB) of mercury arc of 300w pressure was distanced to approximately 50cm from the patient's skin. On the testing sensible area a black bristol board band is placed with 10 orifices of 1 cm^2, nine of which were covered by another black bristol board band. The covered orifice did not receive radiation for 1 minute. After that, as the orifice was exposed and, together with the first orifice, being radiated for 1 minute and thus successively until 10th orifice. The test lasted 10 minutes, which means that the first exposed orifice received irradiation for 10 minutes and the others for fractions from 1 minute less than the first one, respectively. 24 hours after the test's accomplishment, the participant returned to CEFISIO-FIR where it was verified in which orifice the erythema had begun, in this way, acknowledging the MED, serving as a base for the first therapy session.

The sequential therapy according to FERREIRA (2003) states as a matter of principle the addition of one minute in each daily session. Since in our study we carried through the modified sequential we applied the UV therapy in the following manner: the radiation time of the first session was established by the value found from the patient's MED, which, in this in case, was 5 minutes, thus, in the first week she received, 5 minutes in the first day, and each day receiving an additional minute, in such a way that in the second day she received 6 minutes, in the third 7 minutes, the fourth 8 minutes and the fifth day 9 minutes. In the second week, the first day was initiated with the radiation of an additional minute to the initial value, thus initiating with the time of 6 minutes and the days remaining followed the same pattern as established in the first week, that is, with increase of one minute

each day. The therapy followed this scheme along the subsequent weeks. The objective of the increase of the dosage is for keeping a minimum perception of erythema as a clinical indicator of ideal dosimetry.

The physiotherapeutic protocol constitutes in asepsis of the skin, with alcohol at 70%, with the intention of removing impurities and residual cells of the cornea layer, followed by the application of the ultraviolet radiation, where the mercury light bulb was used (of 300W pressure) of the extreme-vitalux-osram brand. The patient as well as the therapist remained with the protective eyeglasses during the Saidman test as well as during therapy.

The injuries had been radiated over lesions in the abdomen, inframammary regions, axillary, left infrascapular, lumbar region and neck. The lesioned areas were undressed and radiated with the light bulb at a distance of 50 cm from the skin. In total 20 physiotherapy sessions were held in a daily frequency, except on Saturdays, sundays and holidays. The patient was reevaluated in the 10th session and in the 20th session, and during the treatment about 7 injuries had been photographed and measured. These lesions were labelled as: left inframammary region (L_1), right inframammary (L_2), to infrascapular (L_3), umbilical scar (L_4), left axillary (L_5), right axillary right (L_6) and neck (L_7).

RESULTS

During the evaluation before initiating the 1st therapy session we noted the presence of 15 lesions decurrent from psoriasis, located in areas as abdomen, armpits, back, neck and hair scalp, showing a redish color and scalling off in all lesions. The patient did not report rashes.

A reduction in paquimetry was evidenced after 10 sessions and this was also after 20 sessions. Table 1 after presents the size (length and width) of the lesions at the initial moment of evaluation and 10th, 15th and 20th therapy session. It can be observed that the reduction in the length of the lesions in percentile terms after 10 sessions was, on average, 14.86 ? 10.65, after 15 sessions was 20.56 ? 14.35 and after 20 sessions, 30.75 ? 20.48, being such reductions statistically significant (p-value=0.018). For the width it can be noted that the lesions' reduction in percentile terms after 10 sessions was on average 10.53 ? 9.60, after 15 sessions 24.05 ? 12,79 and after 20 sessions 29.02 ? 16.01, these reductions being statistically significant (p-value=0.018).

Table 1 - Paquimetry of Lesions, before and after 10, 15 and 20 sessions of Modified Sequential Therapy w/ UV

Measures		Evaluation	10th session		15th session		20th session	
		Measure[1]	Measure[1]	Variation[2]	Measure[1]	Variation[2]	Measure[1]	Variation[2]
Length[3]								
L1	Left Inframammarya	12.45	11.05	-11.24	10.85	-12.85	9.35	-24.90
L2	Right Inframammary	6.30	5.00	-20.63	4.75	-24.60	2.25	-64.29
L3	Infrascapular	5.55	5.40	-2.70	5.35	-3.60	5.15	-7.21
L4	Umbical Scar	5.20	5.10	-1.92	5.00	-3.85	4.70	-9.62
L5	Left Axillary	4.25	3.05	-28.24	3.00	-29.41	2.90	-31.76
L6	Right Axillary	4.15	3.05	-26.51	2.40	-42.17	2.10	-49.40
L7	Neck	8.20	7.15	-12.80	5.95	-27.44	5.90	-28.05
Width[3]								
L1	Left Inframammary	9.00	8.50	-5.56	7.65	-15.00	6.80	-24.44
L2	Right Inframammary	5.05	4.20	-16.83	3.85	-23.76	3.50	-30.69
L3	Infrascapular	3.65	3.60	-1.37	3.00	-17.81	3.00	-17.81
L4	Umbical Scar	1.25	1.10	-12.00	1.00	-20.00	1.00	-20.00
L5	Left Axillary	2.70	2.65	-1.85	2.10	-22.22	1.90	-29.63
L6	Right Axillary	2.60	2.40	-7.69	2.15	-17.31	2.15	-17.31
L7	Neck	7.75	5.55	-28.39	3.70	-52.26	2.85	-63.23

[1] measures in cm.

[2] percentual variation in relation to measured values before therapy sessions.

[3] p-value<0.05

When we compare the use of UV sequential technique with the treatment based on the Minimum Erythema Dose (MED), carried through by Araújo and Fernandes (2004) who used the UVB therapy employing Saidman Test in order to calculate the MED; statistically significant difference was not observed after 15 sessions of treatment, as visualized in table 2, probably this finding might have been influenced by a large standard deviation found in the MED technique.

Table 2 - Paquimetry comparsion between sequential therapy and MED treatment over lesions by the 15th session

Measures by 15th session	N	Minimum	Maximum	Average	Deviation	p-value
Length						
Modifiied Sequential Therapy w/ UV	7	0.20	2.25	1.26	0.78	
MED Therapy	4	0.10	6.26	1.99	2.87	0.648
Width						
Modifiied Sequential Therapy w/ UV	7	0.25	4.05	1.22	1.31	
MED Therapy	4	1.12	4.32	2.66	1.32	0.109

DISCUSSION

The present study demonstrates a satisfactory response to the modified sequential therapy with UV, for the treatment of psoriatic lesions after 10 and 20 sessions, presenting a reduction in the size of the lesions, improvement in the coloration and scalling off. These findings have been also found by some scholars that demonstrates a good evolution in the treatment of psoriasis with UV (ALVAREZ et al, 1986; OLIVER et al, 1994; KARRER et al, 2000; ARAÚJO and FERNANDES, 2004; GRUNDMANN-KOLLMANN et al, 2004).

The protocol proposed in this research consisted of 20 sessions, various authors reported the necessity of a larger amount of sessions to get a more satisfactory response, around 30 sessions (VALDIVIA et al, 1999 and SARICAOGLU et al, 2003). In a study carried through by Grundmann-Kollmann et al (2004) using UVB radiation four times along the week it was necessary a period of 5 to 7 weeks of treatment so that total regression of the lesions was attained. A similar finding in another study carried through where it was necessary a period of 4 to 8 weeks, with daily UVB therapy bearing an average of 50 +/-27 days, for total clearing of the psoriatic lesions. Being also evidenced the inexistence of significant difference it between the effectiveness in the modalities of the therapy with UVB, UVA and PUVA (KARRER et al, 2000).

The paquimetry and the photographic record of the L1 lesions (left inframammary), of the L2 (right inframammary) and of the L3 (left infrascapular) had demonstrated a reduction of the lesions, improvement of the coloration and the scalling off. According to Sampaio and Rivitti (2001) the improvement in the scalling off aspect of the lesions is resulted from the antimytotic

effect, of the ultraviolet radiation, leading to an inhibition of the hyperploriferation of the queratinocites. This improvement also was found in other studies as the ones developed by Araújo and Fernandes (2004) where 4 patients had been submitted to the UVB and PUVA technique and by Alvarez et al (1986), where 29 patients were treated with UV and it was observed that the scales of the skin became later whiterand afterwards unfastening, improvement of the coloration and the lesion's reduction.

In relation to the pigmentation of the plate lesions, it has been observed that the whitening of the lesions happened first in the central region of the injury, progressing to the peripheral region, thus being, the lesions that do not reach total regression become of difficult quantitative evaluation. Milicich et al (1982); Araújo and Fernandes (2004) reported the same fact in their studies.

Another observed aspect was the patient's complaint with regard to the appearance of the lesions, influencing in corporal aesthetic and leading to low self-esteem, after the treatment with the improvement of the lesions the patient became more motivate. The same was found by Gambichler et al (2002) where 42 individuals submitted to the treatment with UV had gotten beneficial responses in relation to their self-esteem.

Some measures are adopted for the therapy with UVB and PUVA, where it is common to use, for maintenance of the treatment, a weekly, biweekly or monthly applied moderate dose in an attempt to prevent the recurrence of psoriasis. The value of this method is difficult to quantify and currently the majority find that the treatment does not have to be prolonged, due to the effect iof ultraviolet radiation in the long run, unless there is good evidence that its interruption will lead to the new development of psoriasis (LOW and REED, 2001).

CONCLUSION

The present work demonstrated the reduction of the seven evaluated psoriatic lesions, in length as in width, with improvement of their scalling off and pigmentation using the UV modified sequential therapy. These findings, by means of the case report, demonstrated the importance in the use of the UV in the treatment of psoriasis as coadjutor, however the study suggests there is not much statistical differences when we compare the technique of the modified sequential therapy with the MED, thus becoming necessary a larger sample for a better scientific evidence.

The application of UV in the physiotherapy has been diminishing and this reduction seems to have occurred in parallel with the increase in the dermatological clinics. With this, related literature is scarce on the performance of the professional physiotherapist in the treatment of psoriasis, becoming necessary a larger number of studies and its comparison when used in other affections that can get response from the radiation with UV in order to contribute for the growth of the physiotherapy in the dermo-functional area.

REFERENCES

AGNE, J. E. *Eletrotermoterapia: teoria e prática.* Rio Grande do Sul: Orium, 2004.

ARAÚJO, A. L. S.; FERNANDES, M.G. *Estudo Comparativo sobre a utilização do PUVA e do UVA no tratamento da psoríase.* Trabalho de conclusão de curso (Conclusão do curso em graduação em Fisioterapia) - Faculdade Integrada do Recife. Recife: Faculdade Integrada do Recife, 2004.

ASHCROFT, D.M.; LI WAN PO, A.; GRIFFITHS, C.E.M. Therapeutic strategies for psoriasis. *Journal of Clinical Pharmacy and Therapeutics.* v.25, p.1-10, 2000.

AUBIN, F.; MOUSSON, C. Ultraviolet light-induced regulatory (supressor) Tcells: an approach for promoting induction of operational allograft tolerance? *Transplatation.* v.77, n.1, p.29 -31, jan/2004.

ALVAREZ, C.; DORFMAN, M.; MION, S. *Experiencia de dos anos en el tratamiento con fototerapia*. Argentina, n.26. p.181-9, jul/1986.

AZULAY, R.D.; AZULAY, D.R. *Dermatologia*. 2.ed. Rio de Janeiro: Guanabara Koogan S.A, 1999.

ELDER, J.T.; NAIR, R.P.; VOORHEES, J.J. Epidemiology and genetics of psoriasis. *J Invest. Dermatol*. v.102, n.6, p.245-75, 1994.

FERREIRA, M.S. *Fisioterapia nos distúrbios vasculares periféricos.* Rio Grande do Norte: Persona, 2003.

GAMBICHLER, T.; BADER, A.; VOJVODIC, M.; BECHARA, F.G.; SAUERMANN, K.; ALTMEYER, P.; HOFFMANN, K. Impact of UVA exposure on phychological parameters and circulating serotonin and melatonin. *BMC Dermatology.* v.2, p.6-12, abr/2002. Disponível em: <http://www.biomedcentral.com/1471-5945/2/6> Data de acesso: 30/08/2005.

GRUNDMANN-KOLLMANN, M.; LUDWING, R.; ZOLLNER, T.M.; OCHSENDORF, F.; THACI, D.;BOEHNCKE, W.H.; KRUTMANN, J.; KAUFMANN, R.; PODDA, M. Narrowband UVB and cream psoralen-UVA combination therapy for plaque-tyoe psoriasis. *American Academy of Dermatology.* v.50, n.5, p.734-9, 2004.

HÖNIGSMANN, H. Phototherapy for psoriasis. *Clinical and Experimental Dermatology.* v.26, p.343-50, 2001.

JEANMOUGIN, M. *Photothérapie et photochimiothérapie par ultraviolets.* Encycl. Méd. Chir. 98-930-A-10, p.16, 1999.

KARRER, S.; EHOLZER, C.; ACKERMANN, G.; LANDTHALER, M.; SZEIMIES, R.M. Phototherapy of psoriasis: comparative experience of different phototherapeutic approaches. *Dermatology.* v.202, p.108-15, 2001.

LEBWOHL, M. *Psoriasis*. The Lancet. v.361, p.1197-204, abr/2003. Disponível em: <www.thelancet.com> Data de acesso: 31/08/2005

LOW, J.; REED, A. *Eletroterapia Explicada Princípios e Prática.* 3.ed. São Paulo: Manole, 2001.

MILICICH, R.; BIANCHI, C.; SCHIUMA, A.; BONINO, M.V.; CASALA, A. Experiencia del uso del PUVA en psoriasis y otras dermatosis. Estudio sobre 312 casos. *Arch. Argent. Dermatol.* v.32, p.333-338, 1982.

OLIVER, M.; GARCÍA, M.; MORALEDA, I.; WEISS, E. Psoriasis e fototerapia: evolucion de respuesta al tratamento. *Archivos del Hospital Vargas.* Caracas/Venezuela. v.36, n.1-2, p.45-8, mar/1994.

RUIZ, M.F.A.; GABURRI, D.; ALMEIDA, J.R.P.; OYAFUSO, L.K. Regressão de psoríase em paciente HIV-positivo após terapia anti-retroviral. *An. Bras. Dermatol*. v.78, n.6, Rio de Janeiro, nov./dez. 2003.

SAMPAIO, S.A.P.; RIVITTI, E.A. *Dermatologia*. 2.ed. São Paulo: Artes Médicas, 2001.

SARICAOGLU, H.; KARADOGAN, S.K.;BASKAN, E.B.; TULANI, S. Narrowband UVB therapy in the treatment of lichen planus. *Photodermatology Photoimmunology & Photomedicine*. v.19, p.265-267, 2003.

VALDIVIA, L.; OBREGAN, L.; ALIAGA, F.; DELGADO, C.;. Artículos de revisíon el PUVA em el tratamiento de la psoriasis. *Dermatologia peruana.* v.9, n.1, p. 27-34, jan/jun, 1999.

VALLAT, V.P.; GILLEAUDEAU, P.; BALTAT, L.; WOLFE, J.; NABEYA, R.; HEFTLER, N.; HODAK, E.; GOTTLIEB, A.B.; KRUEGER, J.G. *PUVA bath therapy strongly suppresses immunological and epidermal activation in psoriasis: A possible cellular basis for remittive therapy.* J. Exp. Med. v.180, p.283-96, 1994.

Address: Bom Pastor Street, 1635 - Apto 103, bloco Java - Cordeiro - Recife - Brasil - PE - Cep. 50670-260 - e-mail:fisio100@yahoo.com.br, Tel: (081) 9194-2354 ou (081) 3271-1439

UTILISATION DE LA RADIATION ULTRAVIOLETTE DANS LE TRAITEMENT DU PSORIASIS: ETUDE DE CAS

Le psoriasis est une dermatose inflammatoire, récurrente, chronique, transmise génétiquement et ayant pour conséquence des altérations dermato - fonctionnelles. Il peut se traiter par un psychothérapeute en liaison avec un docteur dans la récupération tégumentaire. Cette étude veut mesurer l'efficacité de la thérapie séquentielle modifiée en utilisant la radiation ultraviolette sur le psoriasis, après vingt visites de physiothérapie. La volontaire a subi une évaluation antérieure au traitement, à la dixième visite, puis à la vingtième, où les lésions furent mesurées par pachymètre. Résultat: le stimulus usité fut capable d'occasionner la réduction des lésions, l'amélioration de la pigmentation et de la desquamation. Ce travail, a permis de constater l'importance de l'intervention d'un physiothérapeute professionnel dans le traitement du psoriasis via l'utilisation de la radiation ultraviolette.

Mot-clés : ultraviolet, thérapie séquentielle, physiothérapie

UTILIZATION OF ULTRAVIOLET RADIATION IN PSORIASIS TREATMENT: A CASE STUDY

Psoriasis is an inflammatory, recurrent, chronic dermatosis, related to the genetic transmission, that has as consequence dermofunctional alterations , it can be treated by the physiotherapist who together with the doctor will act in the tegumentary recovery. The present study aims at an evaluatation of the effectiveness of the use of the modified sequential therapy, using ultraviolet radiation, at psoriasis, after twenty sessions of physiotherapy. The volunteer was submitted to an evaluation before the treatment, at the tenth session and at the end of the treatment, at the twentieth session, where the lesions had been measured through paquimeter. It was noted that the employed stimulaton was capable of promoting a reduction of the injuries, improvement of the pigmentation and scalling off. With this work it was possible to acknowledge the importance of the professional physiotherapist's action in the treatment of psoriasis, through the use of the ultraviolet radiation.

KEYWORDS: ultraviolet, sequential therapy, physiotherapy.

UTILIZAÇÃO DA RADIAÇÃO ULTRAVIOLETA NO TRATAMENTO DA PSORÍASE : ESTUDO DE CASO

A psoríase é uma dermatose inflamatória, recorrente, crônica, relacionada à transmissão genética, que tem como conseqüência alterações dermato-funcionais, ela pode ser tratada pelo fisioterapeuta que juntamente com o médico irá atuar na recuperação tegumentar. O presente estudo tem como objetivo, avaliar a eficácia da utilização da terapia seqüencial modificada, utilizando radiação ultravioleta, na psoríase, após vinte sessões de fisioterapia. A voluntária foi submetida a uma avaliação antes do tratamento, na décima sessão e ao término do tratamento, na vigésima sessão, onde as lesões foram mensuradas através do paquímetro. Verificou-se que o estímulo empregado foi capaz de promover redução das lesões, melhora da pigmentação e descamação. Com esse trabalho foi possível perceber a importância da atuação do profissional fisioterapeuta no tratamento da psoríase, através da utilização da radiação ultravioleta.

Palavras - chaves: ultravioleta, terapia seqüencial, fisioterapia.

UTILIZACIÓN DE LA RADIACIÓN ULTRAVIOLETA EN EL TRATAMIENTO DE LA PSORIASE: ESTUDIO DE CASO

La psoríase és una dermatosis inflamatoria, recurrente, crónica, genética relacionada a la transmisión genética que tiene como consecuencia alteraciones dermato-funcionales, ella puede ser tratada por el fisoterapeuta que juntamente con el médico actúan en la recuperación tegumentar. El presente estudio tiene como objetivo evaluar la eficacia de una terapia secuencial modificada, utilizandose radiación ultravioleta, en la psoriase, depués de veinte sesiónes de fisioterapia. La voluntaria fué sometida a una evaluación antes del tratamiento, de la décima sesión, y al término del tratamiento, donde que las lesiones fueram mensuradas a través del paquimetro. Verificóse que el estimulo empleado fué capaz de promover la reducción de las lesiones, mejora de la descamación y pigmentación. Con este trabajo fué posible notar la importancia de la actuacion del profisional fisioterapeuta en el tratamiento de la psoriase a través de la utilización de radiación ultravioleta

Palabras - llaves: ultravioleta, terapia secuencial, fisioterapia.