ORIGINAL CONTRIBUTIONS

RELATIVE POTENCY OF TOPICAL CORTICOSTEROID PREPARATIONS

PK Singh and Gurmohan Singh

Efficacy of ten topical corticosteroid preparations was evaluated on ten healthy volunteers by wheal suppression technique of Reddy and Singh modified by Singh and Singh. This double blind study revealed that clobetasol propionate (0.05%) and halcinonide (0.1%) ointments were the most potent steroids i.e. 5 to 6 times more potent than hydrocortisone acetate (1%). Prednisolone (0.25%) and hydrocortisone acetate (1%) were the least potent. The potency of other preparations such as fluocinolone acetonide (0.025%), betamethasone valerate (0.12%), betamethasone dipropionate (0.64%), dexamethasone (0.04%), beclomethasone dipropionate (0.025%) and triamcinolone acetonide (0.1%) was in between. Mid potent steroids were, however 2 times more potent than hydrocortisone acetate (1%). The potency of these three groups of steroid preparations were significantly different from each other. The most potent steroids showed maximum efficacy on the 6th day and the remaining steroids on 8th day of continuous application under occlusion.

Key words : Topical corticosteroids, Bio-assay.

Extensive use of corticosteroids for topical therapy is reflected in all national formularies, and from the sale on pharmaceutical shops. These are available in various forms, alone or with antibiotics, antibacterial and antifungal agents. It is obvious that this 'embarrasse de richesse' does not represent a similar variety of effective ability.[1] Because there is a distinct lack of clinical data on the comparative efficacy of topical corticosteroids, it was decided to assess the relative potency of various topical steroid preparations by the wheal suppression technique of Reddy and Singh,[2] modified by Singh and Singh.[3]

Materials and Methods

Ten healthy volunteers, aged 15 to 30 years with no history of steroid or antihistamine treatment atleast 8 weeks prior to the study were selected. Reddy and Singh[2] technique modified by Singh and Singh[3] was used to measure the volume of histamine induced wheal before and during the course of steroid applications under occlusion. Back[4] was choosen as the experimental site. After cleaning with 70% alcohol, six sites (5 cm distance between two adjacent sites) were selected on each side of the back, lateral to vertebral column. Wheal was induced by pricking with 0.15% histamine acid phosphate solution. We selected one brand from each of the ten steroid preparations more commonly used at our place. A measured amount (0.5 ml) of each of the steroid preparations and a bland cream/ointment (table I) were applied with coded tuberculine syringes on previously numbered sites in a double blind manner. The sites were occluded with polythene and adhesive bandages to keep the dressings in place. Fresh occlusive dressings were applied daily after cleaning with 70% alcohol. Subjects were instructed to avoid

From the Department of Dermato-Venereology, Institute of Medical Sciences, B. H. U., Varanasi-221 005, India.

Address correspondence to : Dr. P. K. Singh, Qr. No. N-13/209-C-14 Brijenclave Colony, Sunderpur, Varanasi 221 005, (U. P.), India.

Table I. Mean and standard deviation of histamine induced wheal volume following application of different steroid preparations.

Steriod	Histamine induced wheal volume on the day					Percent suppression	Potency ratio
	1	2	4	6	8		
Bland ointment cream	52.25 ±20.53	53.53 ±19.95	53.03 ±19.82	52.81 ±19.52	52.29 ±19.65	0	
Clobetasol propionate cream 0.05%	53.31 ±20.27	15.61 ±6.71	5.12 ±2.18	0.67 ±0.36	6.64 ±3.01	98.7	6.0
Halcinonide, ointment 0.1%	50.92 ±19.38	20.16 ±11.16	6.12 ±2.27	0.75 ±0.13	7.66 ±0.80	98.6	5.4
Fluocinolone acetonide ointment 0.025%	53.54 ±19.63	18.50 ±5.99	9.80 ±2.96	5.27 ±2.17	1.66 ±0.67	96.8	2.4
Betamethasone valerate cream 0.12%	52.91 ±19.80	19.11 ±6.23	9.67 ±3.06	5.05 ±0.90	1.70 ±0.56	96.7	2.3
Betamethasone dipropionate cream 0.064%	53.50 ±20.10	16.76 ±8.54	8.51 ±3.70	5.02 ±1.53	1.79 ±0.88	96.6	2.2
Dexamethasone cream 0.04%	52.68 ±19.81	20.68 ±9.44	11.76 ±4.90	4.74 ±1.06	1.83 ±0.60	96.5	2.2
Beclomethasone dipropionate cream 0.025%	51.82 ±19.25	22.99 ±8.28	13.20 ±4.91	5.50 ±1.82	2.09 ±1.39	96.0	1.9
Triamcinolone acetonide ointment 0.1%	52.47 ±19.51	17.17 ±4.83	9.72 ±3.13	5.40 ± 1.73	2.25 ±1.40	95.7	1.8
Prednisolone cream 0.25%	52.86 ±19.11	23.52 ±9.07	14.24 ±5.37	7.47 ±2.58	3.40 ±1.56	93.5	1.2
Hydrocortisone acetate ointment 1.0%	51.98 ±20.20	23.63 ±11.19	14.56 ±4.57	8.69 ±2.71	4.09 ±2.39	92.2	1.0

wetting the dressings. Histamine wheal test was repeated on the 2nd, 4th, 6th and 8th days of the experiment.

Results

Clobetasol propionate (0.05%) and halcinonide (0.1%) were found to be the most potent topical steroids. These were 5 to 6 times more potent than hydrocortisone acetate (1%). The maximum efficacy of these two drugs was observed on the 6th day of the experiment (table I). Hydrocortisone acetate (1%) and prednisolone (0.25%) were the least effective topical steroids. The remaining steroid preparations belonged to the mid potent group. In decreasing efficacy, these were : fluocinolone acetonide (0.025%), betamethasone valerate (0.12%), betamethasone dipropionate (0.064%), dexamethasone (0.04%), beclomethasone dipropionate (0.025%) and triamcinolone acetonide (0.1%). These were two times more potent than hydrocortisone acetate (1%). Topical steroids of the latter two groups showed maximum efficacy on the 8th day of the experiment (table I). Classification of the topical corticosteroid preparations based on their relative potency as measured by histamine induced wheal suppression technique is presented in the table II and fig. 1. These groups were statistically significantly different from each other.

Comments

More and more steroid preparations are being introduced every now and then with high claims of effectiveness. The efficacy of a topical steroid preparation depends, not only on the steroid, but also its concentration, the nature of the base and the particle size of the active ingrediant.[5-8] As new proprietary preparations

Table II. Classification of topical steroids based on wheal suppressing property.

Group	Potency	Steroids	Concentration
Group I	Most potent	—Clobetasol propionate ointment	0.05
		– Halcinonide ointment	0.1%
Group II	Mid potent	—Fluocinolone acetonide ointment	0.025%
		—Betamethasone valerate cream	0.12%
		—Betamethasone dipropionate cream	0.64%
		– Dexamethasone cream	0.04%
		– Beclomethasone dipropionate cream	0.025%
		– Triamcinolone acetonide ointment	0.1%
Group III	Least potent	– Prednisolone cream	0.25%
		– Hydrocortisone acetate ointment	1.0%

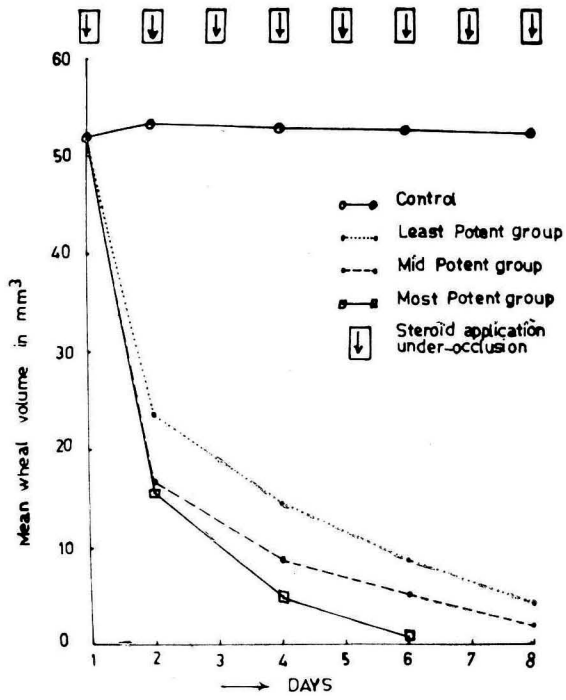

Fig. 1. Curve showing potency ratio of the three groups of steroid preparations.

are added,[9,10] it becomes essential to know their relative efficacy, and to group them,[1,11] potency-wise. Each new preparation has a different base. Most bases now a days are neither creams nor ointment in the conventional terms.[6-8]

Our data, as also the earlier observations[1,11] confirms that clobetasol propionate and halcinonide are the most potent topical steroids. We have tested the ointment bases of these two drugs. These are undisputedly very highly potent. We also found clobetasol propionate (0.05%) to be superior to halcinonide (0.1%), but the difference was not statistically significant. Similarly like earlier reports,[1,11] we also found hydrocortisone acetate (1%) and prednisolone (0.25%) to be least effective, though prednisolone (0.25%) was superior to hydrocortisone acetate (1%). Of the remaining topical steroid preparations tested, in our study fluocinolone acetonide ointment (0.025%) was superior to betamethasone valerate cream (0.12%). Rosenberg[9] has also reported similar findings, through Vogh and Rostenberg[12] found betamethasone valerate ointment (0.025%) to be superior. As the ointment base is more effective than the cream base of the same steroid in the same concentration,[6] the situation might have been different in our study, if we had taken betamethasone valerate in an ointment base.

Contrary to our findings, earlier authors[1,11] have grouped dexamethasone along with hydrocortisone. It may be, because they have used a lower concentration of dexamethasone (0.01%). In our study, triamcinolone acetonide (0.1%) ranked the lowest among the mid potent group very near to the least potent group. It has also been reported earlier,[5] that several extemporaneous preparations of triamcinolone were no better than placebo formulations.

We have classified the topical steroid preparations in three groups according to their efficacy. These groups are significantly different from each other. The potency ratio among these three groups was 5-6 : 2 : 1.

Acknowledgement

M/s Surchem Pharma supplied the bland cream and ointment.

References

1. Wilkinson DS : Topical therapy, in : Textbook of Dermatology, Editors, Rook A, Wilkinson DS and Ebling FJG: Thirded, Vol II, Blackwell Scientific Publication, Oxford, 1979; p 2316-2318.
2. Reddy BSN and Singh G : A new model for human bioassay of topical corticosteroids, Brit J Dermatol, 1976; 94 : 191-193.
3. Singh PK and Singh G : An improvised model for bioassay of topical corticosteroids, Ind J Dermatol Venereol Leprol, 1985 (In Press).
4. Singh PK and Singh G : Selection of sites for bioassay of topical corticosteroids, unpublished data.
5. Coldman MF, Lockerbie L and Laws EA : The evaluation of several topical corticosteroid preparations in the blanching test, Brit J Dermatol, 1971; 85 : 381-387.
6. Stoughton RB and Jolla L : Bioassay system for formulations of topically applied glucocorticoids, Arch Dermatol, 1972; 106 : 825-827.
7. Barry BW and Woodford R : Proprietary hydrocortisone creams, vasoconstrictor activities and bio-availabilities of six preparations, Brit J Dermatol, 1976; 95 : 423-425.
8. Barry BW and Woodford R : Vasoconstrictor activities and bio-availabilities of seven proprietary corticosteroid creams assessed using a non-occluded multiple dosage regimen; clinical implication, Brit J Dermatol, 1977; 97 : 555-560.
9. Rosenberg EW : Fluocinonide, preliminary evaluation of a new topically applied corticosteroid, Arch Dermatol, 1971; 104 : 632-634.
10. Whitefield M and McKenzie AW : A new formulation of 0.1% hydrocortisone cream with vasoconstrictor activity and clinical effectiveness, Brit J Dermatol 1975; 92 : 585-588.
11. Landow RK : Handbook of Dermatologic Treatments, Maruzen Asian Edition, Jones Medical Publications, Greenbrae, 1983; p 177-178.
12. Vogh FC and Rostenberg A : Multi-investigator cooperative comparative studies in clinical research, J Invest Dermatol, 1972; 58; 139-147.