



POWER OF TOPICAL STEROID

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ABSTRACT

Topical steroids, a class of pharmacological agents, have played a pivotal role in dermatology and various medical fields for decades. This comprehensive review aims to elucidate the structure, classification, mechanisms of action, administration, indication, therapeutic uses, and safety considerations associated with topical steroids. Mechanistically, topical steroids exert their effects by binding to glucocorticoid receptors, modulating gene expression, and subsequently attenuating inflammation and immune responses. They are categorized into classes based on potency, allowing clinicians to tailor treatment regimens to specific dermatological conditions, from mild eczema to severe psoriasis. These medications are available in different strengths and forms, including creams, ointment, lotions, and gels. The versatility of topical steroids is reflected in their wide-ranging applications, including the management of inflammatory skin disorders, such as atopic dermatitis, contact dermatitis, and psoriasis. Furthermore, they are valuable adjuncts in post-operative wound care, reducing scar formation, and mitigating pruritus. However, the therapeutic benefits of topical steroids must be weighed against potential adverse effects. Prolonged or inappropriate use may lead to cutaneous atrophy, telangiectasia, striae, and the development of perioral dermatitis. Additionally, systemic absorption can result in hypothalamic-pituitary-adrenal axis suppression, making careful monitoring imperative.

INTRODUCTION

Topical steroids, also known as topical corticosteroids or simply corticosteroid creams, are medications used to treat various skin conditions. They work by reducing inflammation and suppressing the immune response in

the skin. These medications are available in different strengths and forms, including creams, ointments, lotions, and gels.

Topical steroids are commonly prescribed for conditions such as eczema, psoriasis, dermatitis, and certain rashes. They should be applied to the affected area of the skin as directed by a healthcare provider, usually in a thin layer. It's important to follow the prescribed dosage and duration of use, as prolonged or excessive use can lead to side effects like skin thinning or increased risk of skin infections.

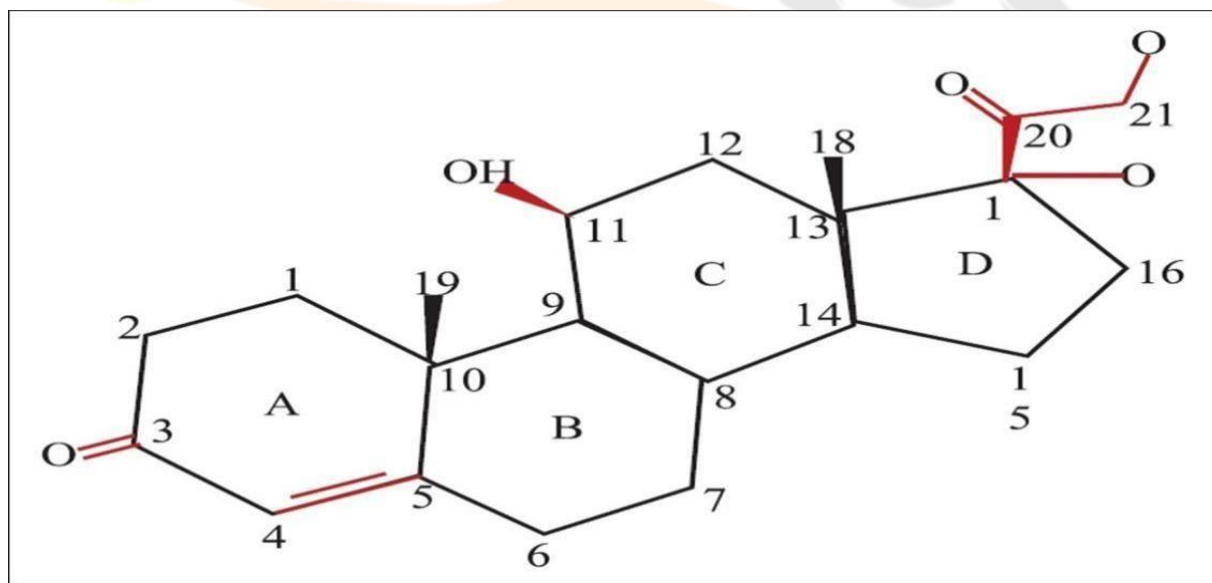
These medications are classified into various potency levels, ranging from mild to high, depending on their strength. The choice of potency and type of topical steroid depends on the specific skin condition and its severity. It's crucial to use them under medical supervision to ensure safe and effective treatment. If you have questions or concerns about using topical steroids, consult a healthcare professional for guidance

STRUCTURE

Hydrocortisone is a natural glucocorticoid derived from the adrenal cortex. Its basic structure forms the backbone of most topical corticosteroid molecules. It showed a much greater anti-inflammatory effect when applied topically than the parent compound cortisone. Thus began the development of various topical corticosteroid compounds.

The cyclo-pentano-perhydro-phenanthrene nucleus of hydrocortisone consists of 21 carbon atoms, and it also has a 17, 21-dihydroxy (OH)-20-keto (O) side chain. For the glucocorticoid action to occur, this side chain is essential. A through D represents the four rings of the structure. Additionally necessary for glucocorticoid activity are the hydroxyl (OH) group at C 11, the double bonds at C4, 5, and the ketone moiety on C3. All other topical corticosteroid compounds are developed from this fundamental structure.

Figure: Structure of hydrocortisone



Fluorination of this molecule at the C6 & C9 atoms increases the potency while addition of acetonide group increases the penetration and percutaneous uptake. Halogenation of the steroid at the C9 & C6 positions increases the potency of the steroid. Simultaneous halogenation of both carbons shows the highest potency of this molecule. Topical agents such as Triamcinolone & Betamethasone have a double bond at the C1 & C2 position with increased glucocorticoid activity and reduced metabolism rate.

The Intrinsic efficacy of topical corticosteroids can be increased by esterification and halogenation. Topical corticosteroids can be classified based on esterification as non-esters, mono-esters and diesters, including both halogenated and non-halogenated compounds within each category. Esterification occurs at the 17- and 21-C positions. This increases the lipophilicity and the 17-21 diesters achieve better permeability through the skin. Esterification with acetate further improves this property. Halogenation gives the compound higher mineralocorticoid properties, including antiproliferative activity; it can be used as a targeted treatment for psoriasis and chronic lichenified eczema.

CLASSIFICATION

Topical steroids are classified into seven classes depending on their different levels of potency. Class I (class one) contains the strongest steroids, while Class VII (class seven) has the least potent ones.

Topical steroids in Class I are 600–1,000 times more potent than those in Class VII.6

The percentages indicated on a product label should not be interpreted as an indication of the product's potency. For instance, a Class I topical steroid at 0.01% is far more potent than a Class VII steroid at 3%.

As per the currently used potency-based classification system, topical corticosteroids can be divided into 7 classes,

1. Class I: super potent (clobetasol propionate 0.05%, halobetasol propionate 0.05%, desoximetasone 0.25%),
2. Class II: high-potent (betamethasone dipropionate 0.05% cream, halcinonide(0.1%),
3. Class III: medium-high potency (fluticasone propionate 0.005% ointment),
4. Class IV medium potency (mometasone furoate 0.1% cream),
5. Class V: medium potency (betamethasone valerate 0.1% cream, fluocinolone acetonide 0.025% cream),
6. Class VI: low potency (desonide 0.05% cream, fluocinolone acetonide 0.01% cream), and
7. Class VII: low potency (hydrocortisone acetate, dexamethasone acetate 0.1%).

Non-halogenated corticosteroids include hydrocortisone (and its derivatives), desonide and prednicarbate. Methylprednisolone seponate is a newer non-halogenated topical corticosteroid but is not yet available in India.

Topical steroids can be prescribed or purchased over the counter (OTC). They come in different strengths and forms, such as ointments or creams.

This article explores how topical steroids work, how they are grouped by strength, and examples of drugs. There are many drugs and formulations within each class of topical steroids:

Topical Steroid Class I

The highest potency topical steroids include:

- Temovate (clobetasol propionate) 0.05% ointment
- Ultravate (halobetasol propionate) 0.05% cream, ointment, or lotion
- Psorcon (diflorasone diacetate) 0.05% ointment
- Diprolene (betamethasone dipropionate) 0.05% ointment or gel.

Topical Steroid Class II

These topical steroids are considered highly potent:

- Lidex (fluocinonide) 0.05% cream, gel, ointment, or solution
- Halog (halcinonide) 0.1% cream, ointment, or solution
- Cyclocort (amcinonide) 0.1% ointment

Topical Steroid Class III

These topical steroids are considered potent:

- Elocon (mometasone furoate) 0.1% ointment
- Cutivate (fluticasone propionate) 0.005% ointment
- Betanate (betamethasone dipropionate) 0.05% cream.

Topical Steroid Class IV

These topical steroids are considered moderately potent:

- Synalar (fluocinolone acetonide) 0.025% cream or ointment
- Cordran (flurandrenolide) 0.05% cream, ointment, or lotion
- Triderm (triamcinolone acetonide) 0.1% cream, ointment, or lotion

Topical Steroid Class V

These topical steroids are considered somewhat potent:

- Westcort (hydrocortisone valerate) 0.2% cream or ointment
- Locoid (hydrocortisone butyrate) 0.1% ointment
- Dermatop (prednicarbate) 0.1% cream or ointment
- Pandel (hydrocortisone probutate) 0.1% cream

Topical Steroid Class VI

These topical steroids are considered mild:

- Desonate (desonide) 0.05% gel
- Synalar (fluocinolone acetonide) 0.025% cream, solution, or shampoo

Topical Steroid Class VII

These topical steroids are considered the least potent:

- Hytone (hydrocortisone) 2.5% cream and lotion¹¹
- Hydrocortisone 1% (many over-the-counter brands of creams, ointments, and lotions)
- Anusol-HC (hydrocortisone acetate) 0.5% and 1% creams.

MECHANISM OF ACTION

Topical steroids also known as topical corticoids or corticosteroids are medications used to treat various inflammatory skin conditions. The mechanism of action of topical corticosteroids is vast, consisting of anti-inflammatory, anti-mitotic, immunosuppressive effect, protein and carbohydrate metabolic effect, water and electrolytic effect, central nervous system effect and blood cell effect. They have both genomic and Nongenomic mechanisms of action mediated through the glucocorticoid receptor, leading to most

anti-inflammatory and immunosuppressive effects. They work by exerting their effect at cellular level through several mechanisms of action. Here is the primary mechanism of action of topical steroids.

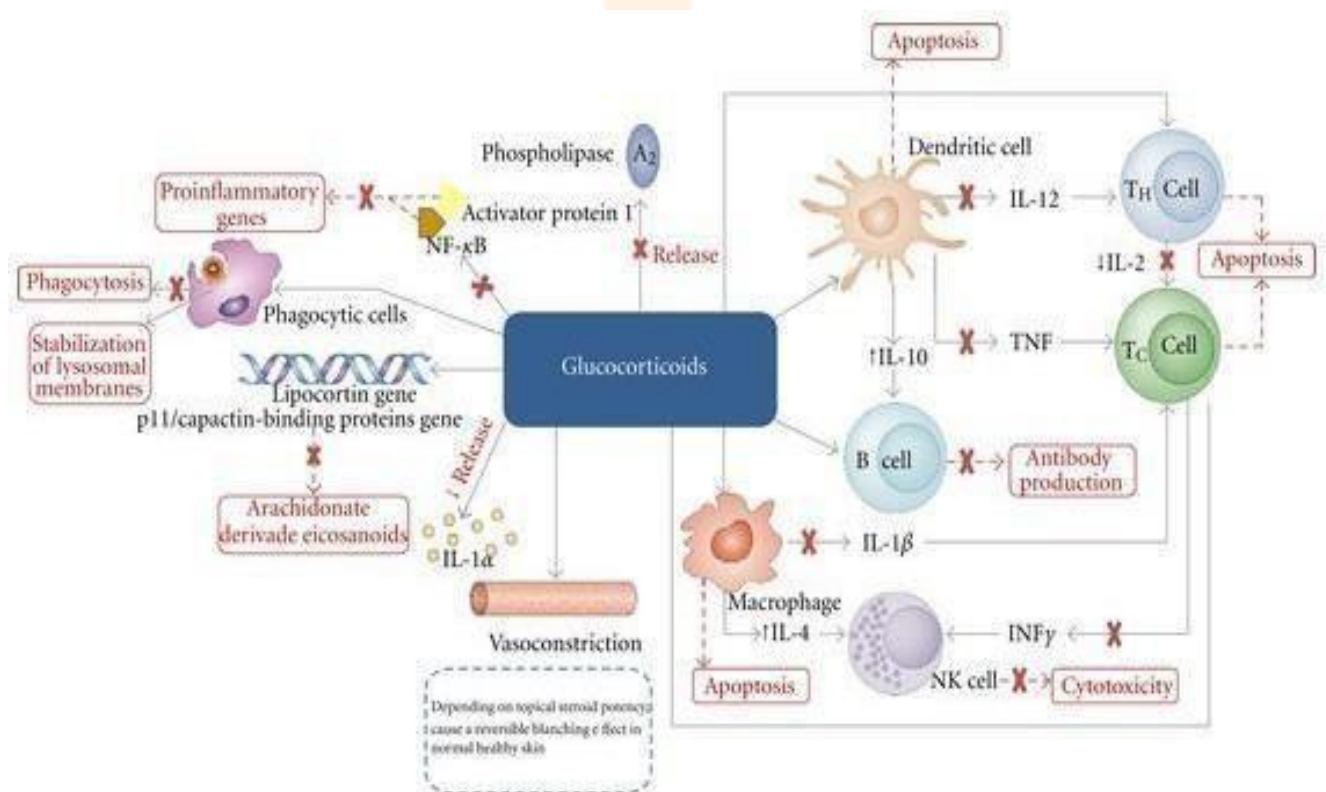
Anti-inflammatory effect: Topical steroids have potent anti-inflammatory properties; they bind to cytoplasmic receptors within skin cells called glucocorticoid receptors. This binding triggers a series of intracellular events that lead to the suppression of inflammatory mediators such as prostaglandins and leukotrienes. Topical corticoids also act directly at the DNA level to increase the expression of anti-inflammatory transcription factors such as NFKB to decrease the expression of proinflammatory genes. As a result, the release of inflammatory chemical and immune system response is reduced, leading to a decrease in skin redness, swelling, and itching.

Vasoconstriction: Topical steroids have a vasoconstriction effect, meaning the narrow blood vessels in the skin. Vasoconstriction of blood within the upper dermis decreases the number of inflammation mediators being delivered to the region applied. This action helps to reduce swelling by decreasing the blood flow to the affected area.

Immunosuppressive effect: Topical steroids can suppress the immune system response in the skin. They inhibit the migration of immune cells to the site of inflammation and reduce the release of pro-inflammatory cytokines. This action helps to alleviate the immune mediated component of various skin conditions such as eczema, psoriasis and allergic reaction. The Nongenomic mechanism occurs May rapidly and is mediated through interacting between intracellular glucocorticoid receptor and membrane bound glucocorticoids receptor. Within second to minute of receptor activation a cascade of effects is set including inhibition of phospholipase A2 which is critical for producing inflammatory cytokines impairing releases of arachidonic acid and regulation of apoptosis in thymocytes.

Corticosteroids at high concentration will also inhibit production of beta cells and t cells. Topical steroids can inhibit the excessive growth and reproduction of skin cells that occur in conditions like psoriasis. By slowing down cell turnover, they help to normalize the skin's appearance and relieve scaling and thickening. The potency and duration of action of topical steroids vary depending on the specific formulation and strength of the steroids.

Antimitotic effect of topical steroids plays a great role in the treatment of psoriasis. It is proposed that this decrease in epidermal mitosis is secondary to an increase in lipoprotein, an endogenous glucocorticoids regulated protein. An antimitotic effect is also present in the dermis which inhibits cell and collagen synthesis.



INDICATION

Topical steroids are commonly used to treat various skin conditions characterized by inflammation, itching, and redness. They are available in different strengths and formulations, ranging from mild to potent. Here are some indications for the use of topical steroids; topical steroids are frequently used as the first line treatment for eczema, they enhance the overall look of the skin and aid in reducing irritation and itching. Topical steroids are a treatment option for mild to moderate psoriasis. They assist in lowering skin redness, scaling and itching by suppressing the overactive immunological response in the skin. A localized inflammatory reaction known as contact dermatitis can occur when the skin encounters an irritant or allergen. To minimize swelling and relieve discomfort, topical steroids can be given to the affected area.

Topical steroids can offer comfort by lowering stinging, swelling and redness in cases of mild allergic reaction such as insect bites or allergic rashes. Seborrheic dermatitis is a typical ailment that causes red, scaly patches on scalp, face and other places where sebaceous glands are reducing seborrheic dermatitis – related swelling and scaling. Lichen planus is an inflammatory skin condition that can affect the skin, mouth nails and genitalia among other regions of the body topical steroids may be applied locally to reduce inflammation and treat symptoms.

It's important to note that topical steroids should be used under the guidance of health care professionals. Prolonged and inappropriate use of potent steroids can lead to side effects, such as skin thinning, stretch marks, and increased susceptibility to infection. The duration of treatment and choice of strength will depend on the specific condition being treated and individual patient factor.

CONTRAINDICATION

Topical corticosteroids should not be used to treat bacterial infections because they hide the infection with their anti-inflammatory and vasoconstrictive effects, delaying identification and treatment. Additionally, topical steroids should not be used for cellulitis, erysipelas, lymphangitis, impetigo, furuncles, carbuncles, or erythrasma. Dermatophytes and candida are related contraindications. Tinea incognito, a persistent fungal infection characterized by accelerated spread, inflammation, and pustule production, might be brought on by the immunosuppressive effects.

ADMINISTRATION

The administration of topical steroids refer to the application of corticosteroid medication in the form of creams ointment, lotion, are gels directly to the skin, topical steroids are widely used to treat various skin condition, including eczema, psoriasis, dermatitis rash and allergic reaction. They work by reducing inflammation, suppressing the immune system, and alleviating itching, redness and swelling. Topical corticosteroids are administered topically; however, successful administration depends upon obtaining an accurate diagnosis, choosing the correct drug, selecting the appropriate vehicle and potency, and the frequency of application.

The clinician must keep many factors in mind upon deciding to initiate corticosteroid therapy, including the route of administration preparation. The vehicle is the carrier of drugs. The selection of vehicles depends upon region affected and type of lesion present. It also functions to hydrate the skin and increase absorption. The vehicle includes the following:

Creams: Cream are less potent than ointment but cosmetically more appealing since they leave no residue; the drying, non-occlusive nature leads to their administration for acute exudative inflammation and dermatitis within the intertriginous areas. The creams are mixes of water suspended in oil. They have good lubricant qualities and their ability to vanish into skin makes them cosmetically appealing. Cream does not provide the occlusive effect that ointment provides.

Ointment: Administered for thick hyper-keratotic lesions; the most potent vehicle since they are the most occlusive and should not be administered on hair bearing regions because it may result in folliculitis. Ointment

provides more lubrication and occlusion than other preparation. Their greasy nature may result in poor patient satisfaction and compliance.

Lotions: Less occlusive and greasy work well in hair bearing regions. Lotions contain alcohol, lotions are useful for hairy areas because they penetrate easily and leave little residue.

Gel: Like lotion, less occlusive and greasy; work well hair bearing regions more beneficial for the scalp as they do not cause matting of the least occlusive and greasy hair.

Foams: Highly effective for steroid delivery to the scalp but are costly, they are easily applied and spread readily particularly in hairy areas.

There are seven groups of topical steroids potency. Ranging from ultra-high potency to low potency.

Low potency steroids are the safest agent for longer term use on large surface areas on the faces or areas of the body with thinner skin and on children more potent agents are beneficial for severe disease and for areas of the body where the skin is thicker, such as palms and bottom of the feet . High and ultra-potency steroids should not be used on the face, groin, and axilla or under occlusion except in rare situations and for short duration.

MONITORING

Monitoring of topical steroids typically involves assessing the patient's response to treatment, evaluating the effectiveness of the medication and monitoring for any potential side effect or adverse reaction. This workup includes diabetes, hypertension, congestive heart failure, hyperlipidaemia, psychiatric disorder and osteoporosis. The duration of treatment should not be greater than 2 to 4 weeks, regardless of potency, high potency steroids should not be administered for longer than 2 weeks and after this period, should be tapered to avoid adverse effects. Significant interaction between corticosteroid and other drugs also exists, so concurrent use of the other medication should undergo an evaluation as changes in their management may be warranted.

Ant hyperglycaemic drugs may show less efficacy as glucocorticoid may counteract their effects; this would require increased frequency of blood glucose monitoring and possible adjustment of the ant hypoglycemic medication. Corticosteroid effect may be reduced by some antivirals and increased by others so closer monitoring for corticosteroid effect and toxicity is recommended during concurrent use. Guidelines to prevent adverse effects include the use of lower-potency steroid morning only application, alternate –day treatment and decreasing the extent of occlusion.

Topical steroids are available in various potencies and formulations, ranging from mild to very potent. The choice of potency and formulation depends on the severity and location of skin condition. It's crucial to consult with a health care professional for personalized advice and guidance regarding the use and monitoring of topical steroids.

ADVERSE EFFECTS OF TOPICAL STEROID

Various adverse effects occurring due to topical corticosteroids have been extensively published in the literature. They can be broadly classified as local and systemic adverse effects. The immediate effects include stinging and irritation. Effects on the epidermis are atrophy, hypo/hyperpigmentation, photosensitivity, loss of skin barrier and premature aging. Topical steroids also adversely affect dermal functions such as wound healing and collagen formation leading to telangiectasias, ulcerations, delayed wound healing, striae distensae, Bateman's purpura, easy bruising, and stellate scars. Steroid-induced acne, rosacea, hypertrichosis, and alopecia are known adverse events.

Steroids also increase susceptibility to infections leading to altered presentations such as scabies incognito/crusted scabies, candidiasis, tinea incognito, herpes incognito, impetigo incognito and demodicosis. Steroids can also cause allergic contact dermatitis, perioral dermatitis, contact urticaria and granuloma gluteale infantum. Topical steroid- induced rosacea and acne are frequently seen in practice.

Withdrawal of steroids frequently leads to rebound flares of psoriasis, pustular psoriasis, reactivation of Kaposi's sarcoma and rebound erythema of the face, topical steroid damaged facies is a newly described entity associated with topical corticosteroid abuse. Steroid addiction led to burning skin syndrome and status cosmetics have been reported in the literature.

SIDE EFFECTS

Side effects of topical steroids include hypothalamus-pituitary-adrenal axis suppression, new onset diabetes mellitus/hyperglycemia, iatrogenic Cushing's syndrome, mineralocorticoid effects (enema, hypocalcaemia, hypokalaemia, hypertension) and adrenal suppression. Steroids can also induce growth retardation in children, osteoporosis and avascular necrosis of bones in adults. Ocular side effects include posterior subcapsular cataract and glaucoma.

Proper patient selection, careful and correct prescription, appropriate use of the drug and adequate counseling remain the mainstay of preventing adverse effects of topical steroids. Some specific ways to reduce the incidence of side effects are use of steroids with lower potency in susceptible age groups, tapering of doses and frequency of application after initial therapeutic response is achieved, week-end maintenance therapy, once daily applications, and avoidance of occlusion.

MISUSE OF TOPICAL STEROID

Misuse of topical corticosteroids has a huge impact on dermatological practice, leading to a significant proportion of visits to the dermatologist. This hydra-headed problem needs multi-dimensional interventions, involving educational, legal and managerial approaches with cooperation from different sectors of society. Topical corticosteroids are easily available over the counter at a low price, misuse has been noticed among the general population, producing many adverse effects. Despite being a common problem, only few studies have investigated the misuse of topical corticosteroid products in India.

Background: Topical corticosteroids (TC) are among the most used medications for treatment of skin disorders. They give immediate relief from symptoms in many inflammatory dermatoses. Even inappropriate use in infectious dermatoses relieves the symptoms. This study was done to analyze the misuse of topical corticosteroids in the Indian population and to analyze the attitude of patients towards self-medication.

Methods: All patients presenting with various dermatoses to the investigator were asked about history of usage of any topical medication on the lesion. In case of a positive answer, the investigator ascertained whether the topical medication in question contained a corticosteroid. The total number of patients seen during the recruitment period (January 2012 – December 2012) was noted on a separate list. Full questionnaires were only filled for patients with a history of using topical corticosteroids.

Results: 5256 patients were screened out of which 4100 (78%) were already using topical medications. 3154 (60%) patients were using topical steroids in various forms. About 80% of the patients using topical steroids confessed that they have not consulted qualified medical practitioners. They were advised these medications by chemists, friends or quacks, neighbors, barbers, beauticians etc.

Conclusions: Misuse of topical corticosteroids is common in the Indian population and results in various complications. Educating the public, chemists, general practitioners along with strict vigil by law enforcing agencies is needed for optimal and safe use of corticosteroids.

CONCLUSION

Even several decades after their introduction, topical corticosteroids are first line therapy for various dermatological conditions. Though topical calcineurin inhibitors have become available, the value of topical

corticosteroids has not diminished. However, maintaining the fine balance between judicious use and frequent abuse of these compounds is difficult. Until newer and safer topical corticosteroids become available, physician vigilance and patient education remain the mainstay of tackling this growing problem. This review provides a comprehensive overview of their mechanisms of action, clinical applications, and potential risks, emphasizing the importance of judicious prescribing and vigilant monitoring to maximize their efficacy and minimize adverse outcomes.

REFERENCE

The reference of the topic is carried out by some textbooks, manuals, journals and some information are gathered from internet with some reference links as shown below:-

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