CHAPTER

# 1

# Topical Corticosteroids

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## SUMMARY

- All steroids have a basic 4-ring structure with 3 hexane rings (designated A to C) and one pentane ring (designated D) with hydroxyl (OH) group at C11, a double bond at C4–5 and ketone moiety on C3. However, parts of the ring and side chains can be modified to increase penetration, potency and specificity of action and reduce side effects.
- Therapeutic effects (anti-inflammatory, antiproliferative and atrophogenic effects) of topical corticosteroids (TCS) are mediated by classical genomic and non-genomic pathways.
- Two important systems of classification of TCS on the basis of potency are British system (classes I to IV) and American system (classes I to VII), with class I being the most potent. However, apart from the structure of the steroid, clinical potency (hence efficacy and side effect profile) of TCS depends on other factors including concentration, formulation, method of application (with occlusion/hydration), site of use and background condition of skin.
- Dermatological conditions can be divided on the basis of their response to steroids into highly responsive, moderately responsive and least responsive.
- TCS are the first-line treatment for dermatitis including atopic dermatitis (AD) which is a highly steroid-responsive dermatoses. Once control of AD is achieved with a daily regimen of TCS, long-term remissions can be sustained in a subset of patients with twice weekly applications of potent TCS in order to reduce TCS-induced adverse effects. In children with extensive disease, diluted TCS under wet wrap dressings may be used to avoid systemic administration of steroids.
- TCS are of established value in psoriasis. Potent and very potent TCS are the most commonly used topical therapy for localized disease. In widespread disease, mild or moderate potency TCS are used as an adjunct to systemic therapy. Mild-to-moderate potency TCS are also first line of therapy in flexures. If lesions are thick, then TCS are often combined with salicylic acid in ointment base. Soaking of the affected part prior to TCS application is of particular value in palmoplantar psoriasis.

- Vitiligo is moderately steroid-responsive dermatoses and TCS are the first-line therapy for localized disease. Compared with PUVA, which promotes a predominantly perifollicular pattern of repigmentation, TCS result in more diffuse repigmentation, which occurs more quickly but is less stable.
- TCS and topical antifungals, either alone or in combination, are the mainstay of therapy in seborrheic dermatitis. In very hyperkeratotic lesions over scalp, TCS in lotion formulation are used and the scalp can be occluded with a shower cap overnight.
- Potent and very potent TCS are the first-line therapy in pompholyx.
- Potent and very potent TCS, when used under supervision and for finite duration, are the first line of treatment for lichen sclerosus in adults as well as in children in both sexes.
- Treatment of lichen simplex chronicus is aimed at interrupting the itch-scratch-itch cycle and the first-line measures to control itch include use of potent or very potent TCS and antihistamines. Petrolatum can be applied to the surrounding skin to avoid perilesional hypopigmentation and atrophy.
- TCS may be used in aphthous stomatitis to hasten healing and reduce the associated pain.
- TCS, particularly the potent ones when used for at least 3 months, have shown efficacy in some studies of localized alopecia areata, although the results are variable and they do not appear to be effective in alopecia totalis/universalis.
- Potent and very potent TCS have emerged as first-line therapy for limited bullous pemphigoid. In extensive disease, TCS are invariably used as an adjunct to systemic therapy but may be used even as a standalone therapy of very potent TCS as whole body twice a day application in patients who cannot use systemic steroids. Such use is, however, limited by practical factors (time needed, compliance and cost).
- TCS are required in most patients of allergic contact dermatitis for rapid alleviation of symptoms, along with other measures including use of emollients and antihistamines.
- TCS are the cornerstone of initial therapy for patients with limited discoid lupus erythematosus and is one of the few conditions warranting use of potent steroids on the face.
- Although TCS are widely accepted and are practically almost always used as first-line treatment in lichen planus (LP), there is paucity of scientific evidence supporting this conventional therapeutic modality. A potent TCS once daily application is used until remission in cutaneous LP. For oral LP, potent TCS may be applied three times daily with a gloved finger in symptomatic patients.
- Optimal use of TCS includes choosing the right potency formulated in appropriate vehicle, used inappropriate concentration and amount for an adequate duration.

- The choice of potency of TCS used depends on the dermatoses to be treated, type of lesion, site of lesion and the body surface area involved. It is recommended that therapy should be initiated with lowest potency of TCS to sufficiently control the disease and once partial disease control is achieved, a lower potency TCS is introduced.
- Once daily application is as efficacious as more frequent applications of very potent steroid and sudden discontinuation should be avoided after prolonged use to prevent rebound phenomenon.
- Simple practical guides to the quantity of a topical medication to apply are provided by the fingertip unit (FTU). As a thumb rule no more than 50 g/week of potent and 100 g/week of mild or moderate potent TCS should be used in an adult.
- Prior hydration of the skin helps in optimising results with TCS and they may be used under occlusion (by bandage, gloves and socks, cling film) for thick or lichenified lesions.

## INTRODUCTION

- Even after 65 years of their initial discovery, steroids remain the most commonly prescribed anti-inflammatory agents in dermatology and are used in a large number of dermatological conditions.
- Safe and effective use of topical corticosteroids (TCS) requires knowledge of the various molecules formulations and potencies.
- TCS have a long list of potential side effects and newer molecules are being introduced, to improve efficacy and circumvent the adverse effects.

## HISTORY AND EVOLUTION OF TCS

- Kendall and his team in 1948 isolated the extract of bovine adrenal glands and marked the compounds from A to F. Of these six compounds, E (cortisone) and F (hydrocortisone) were found to be medically effective. The team received the Nobel prize in 1950 for the discovery and elucidating the structure and biological effects of glucocorticoids.
- Sulzberger and associates first time reported the use of steroids in dermatology. However, it was a challenge to use corticosteroids topically, as corticosteroids with—O group at the C11 position (e.g. cortisone) had to be reduced to 11-hydroxyl analogs (e.g. hydrocortisone) to be effective, and this change does not happen in skin. This group created history in 1952 by successfully treating eczematous eruptions with topical hydrocortisone. Decades of research and widespread use led to the development of a variety of TCS preparations and formulations.

## STRUCTURE[1]

- All steroids have a basic 4-ring structure with 3 hexane rings (designated A to C) and one pentane ring (designated D; Fig. 1.1a) with hydroxyl (OH) group at C11, a double bond at C4–5 and ketone moiety on C3. However, parts of the ring and side chains can be modified to:
  - Increase penetration
  - Increase potency
  - Increase specificity of action
  - Reduce side effects.
- Hydrocortisone is the prototype TCS molecule (Fig. 1.1b) and modifications done to the basic molecule include:
  - *Esterification*: Esterification at 16-, 17-, 21-positions result in:
    - Improved penetration: As it increases lipid solubility.
    - Decreased systemic side effects: Because of increased de-esterification resulting in formation of inactive metabolites.
    - Increased potency of molecule, e.g. esterification at 17-position of betamethasone (Fig. 1.1c) results in formation of betamethasone-17-valerate (Fig. 1.1d), which is 125 times more potent than betamethasone because of greater binding to glucocorticoid receptor (GCR). In contrast esterification at 21-position results in formation of betamethasone-21-valerate, which binds less tightly to GCR, but is more lipophilic, so has better percutaneous absorption.
  - *Halogenation*: Halogenation at 6-, 9- or 21-position increases potency especially antiproliferative effect which can be utilised as targeted therapy in psoriasis and chronic lichenified eczema:
    - Chlorination at 21-position produces clobetasol propionate (Fig. 1.1e) which has increased binding to GCR and this chlorination also inhibits de-esterification at 17-position resulting in significantly increased potency.
    - Fluorination at 6- and/or 9-position increases potency (e.g. difluorosone diacetate) by inhibiting de-esterification.
  - *Hydroxylation*: Addition of hydroxyl group at 16-position reduces mineralocorticoid activity, e.g. triamcinolone acetonide.
  - *Others*:
    - Addition of methyl group at 16-position reduces mineralocorticoid activity.
    - A double-bond in 1–2 position increases glucocorticoid activity.
    - Some topical steroid molecules have OH groups at 11-, 17- and 21-positions or ketone groups at 3- and 20-positions or a double-bond at 4-position of the glucocorticoid nucleus.

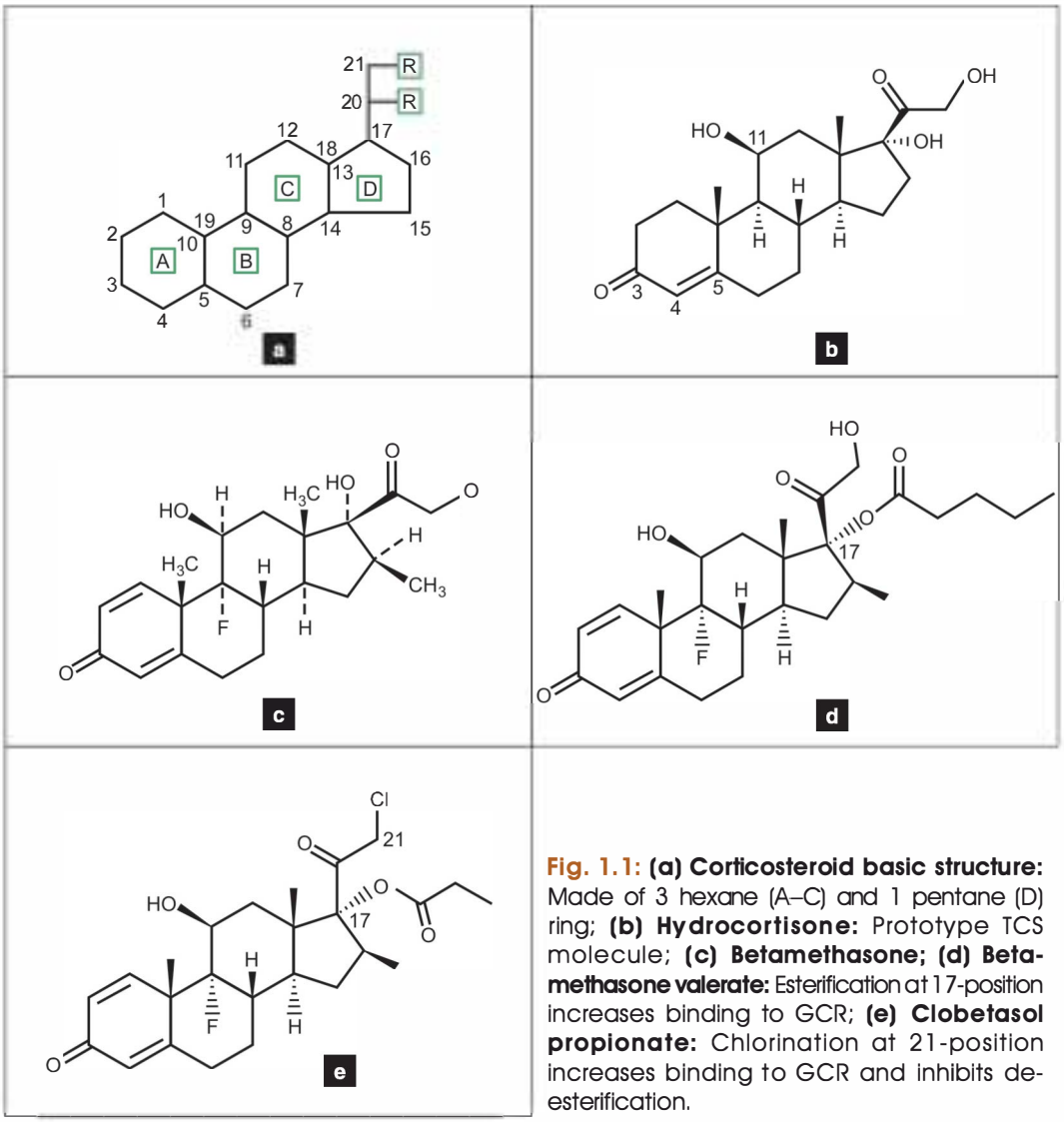


**Fig. 1.1: (a) Corticosteroid basic structure:** Made of 3 hexane (A–C) and 1 pentane (D) ring; **(b) Hydrocortisone:** Prototype TCS molecule; **(c) Betamethasone; (d) Betamethasone valerate:** Esterification at 17-position increases binding to GCR; **(e) Clobetasol propionate:** Chlorination at 21-position increases binding to GCR and inhibits de-esterification.

## MECHANISM OF ACTION OF TCS[2]

TCS diffuse through the stratum corneum barrier (a rate-limiting step in drug delivery) and through plasma membrane (easily pass due to their lipophilic structure) to reach the cytoplasm of cells in the epidermis and dermis. In the cytoplasm they bind to a specific receptor, the glucocorticoid receptor (GCR) and binding to these receptors (based on their chemical structure) determines potency of corticosteroids.

Therapeutic effects of steroids are mediated by:

- Classical genomic effects.
- Non-genomic effects.

### Classical Genomic Mechanism of TCS Action

- ***Glucocorticoid receptor GCRα*[a]:** It is a protein which belongs to the same receptor superfamily as receptors for other steroids, thyroid hormone, calcitriol, etc. The unligated cytosolic GCR (cGCR) is located in cytoplasm as a multi-protein complex (composed of HSP 70, HSP 90, chaperone immunophilins).
- ***Molecular mechanism*:** TCS bind to GCR to form GC-GCR complex, with dissociation from HSP 90 (capping protein) from the GCR. Thereafter GC-GCR complex translocates to the nucleus and binds to the GC response elements (GRE) in DNA, causing alteration in transcription and translation of proteins.

### Non-genomic Mechanism of TCS Action

Rapid anti-inflammatory and immunosuppressive actions of TCS (actually both of topical and oral steroids) are mediated by three different mechanisms:

- ***Non-specific interactions with cellular membranes*:** TCS have several effects on plasma and mitochondrial membranes of immune cells.
- ***Non-genomic effects mediated by GCR*:** When GCR binds to its ligand, it dissociates from the multi-protein complex and many of these molecules are responsible for rapid GC effects. So GCR is not only important as a nuclear regulator of gene transcription, but is also involved in rapid non-genomic GCR-induced effects.
- ***Specific interactions with a membrane-bound GCR (mGCR)*:** Apart from cytoplasm (cGCR), GCRs are also present on cell membrane (mGCR) and several kinases are rapidly inhibited *in vitro* and *in vivo* by treatment with TCS, mediated *via* a mGCR-dependent pathway.

## EFFECTS OF TCS[2]

### Anti-inflammatory Effects

#### Direct Effects

TCS have several direct effects which help to reduce inflammation immediately:

- ***Stabilization of cell membrane and lysosomal membrane*** thereby preventing release of lysosomal contents and phospholipid precursors required for synthesis of prostaglandins and platelet activating factor (PAF) which are mediators of inflammation.
- ***Vasoconstriction*:** This is mediated by—
  - Potentiating vascular response to catecholamines.
  - Reducing sensitivity of vascular smooth muscle to vasodilators like histamine, bradykinin and nitric oxide (NO).

[a]**GCRα:** Consists of 3 different domains with various functions—N terminal domain containing transactivation functions, a DNA binding domain and a ligand binding domain. A GCR β-isoform does not bind to GC, but is believed to regulate transcriptional activity and so is an endogenous inhibitor of GC action and may be an important marker of steroid insensitivity.

- ***Effect on mast cells*:**
  - Inhibit mast cell sensitization induced by IgE.
  - Inhibit release of mast cell mediators like histamine.

### GCR-mediated Effects

TCS induce synthesis of several anti-inflammatory proteins mediated through GCR and these effects are delayed. The proteins include:

- ***Lipocortins*:**
  - Prevent formation of potent inflammatory mediators (prostaglandins, leukotrienes, 12-HETE, and 15-HETE).
  - Prevent PAF-induced wheal and flare reactions and leukocyte chemotaxis.
  - Decrease vascular permeability.
- ***Vasocortin*:** Inhibits histamine release from mast cells.
- ***Vasoregulin*:** Decreases vascular permeability.

### Anti-inflammatory Effect on Specific Cells

This action is mediated both directly and through GCR. Cells affected include:

- ***Polymorphonuclear leukocytes*:**
  - Reduced ability to adhere to vascular endothelium.
  - Reduced migration to sites of inflammation.
  - Reduced number at sites of inflammation.
  - Reduced phagocytosis, bactericidal activity, release of acid hydrolases and pyrogens.
  - Cause abnormal nitroblue tetrazolium test *in vitro.*
- ***Monocytes*:**
  - Reduced number at sites of inflammation.
  - Reduced fungicidal activity and clearance of opsonized particles.
  - Reduced response to macrophage activating factor and decreased chemotaxis.
  - Reduced response to mixed leukocyte reaction.
- ***Lymphocytes*:**
  - Reduced response of lymphocytes to concanavalin A-induced T cell blastogenesis, and to tetanus toxoid and streptodornase-streptokinase.
  - Reduced antibody-dependent cell-mediated cytotoxicity.
  - Reduced natural killer cell activity.
- ***Langerhans' cells*:**
  - Moderate potency TCS decrease expression of Fc receptor, C3b receptor, and HLA DR positivity, with no alteration in CD1a antigen expression.
  - Very potent TCS cause loss of cells expressing Langerhans cell markers.
- ***Effects on immune cytokine production*:**
  - Reduce production of IL-1, IL-2, interferon-γ, tumor necrosis factor and granulocyte monocyte colony-stimulating factor.

## Antiproliferative and Atrophogenic Effects

### Epidermis

- ***Effects of TCS on epidermis*:**
  - Reduced thickness of stratum corneum.
  - Reduced or absent granular layer.
  - Flattened basal layer with reduced mitoses.
  - Suppressed keratinocyte growth factors.
  - Reduced production of melanin by melanocytes.
  - Normal keratinocyte ultrastructure (keratin filaments, keratohyalin granules, membrane-coating granules).
  - Unaffected basement membrane.
- ***Mediators*:** TCS reduce levels of molecules (opioid peptides, enkephalins), which modulate epidermal differentiation and inflammatory processes.

### Dermis

- ***Early atrophy*:** Changes seen include:
  - Reduction in dermal volume:
    - Reduction of amount of glycosaminoglycans (GAGs).
    - Decreased water content (due to loss of GAGs and TCS-induced vasoconstriction).
  - Hypoactive fibroblasts:
    - Suppression of procollagen transcription.
    - Reduced activity of prolyl 4-hydroxylase and lysyl oxidase.
    - Decreased hyaluronate synthetase activity.
  - Collagen and elastic fibers unchanged.
- ***Late atrophy*:**
  - Dermal volume reduced.
  - Collagen and elastic fibers diminished (starts within 3 days of administration but manifests late) and abnormally aggregated.
  - Hypoactive fibroblasts.
  - Dermal vessels become fragile, due to loss of fibrous tissue and ground substance support.

## Vasoconstriction

TCS cause constriction of superficial dermal capillaries thus reducing erythema but the mechanism of TCS induced vasoconstriction is not yet completely known. It is thought to be related to inhibition of release of natural vasodilators such as histamine, bradykinins and prostaglandins and endothelial NO.

## Systemic Effects

Effects following systemic absorption on metabolic and other areas are similar to those seen with systematic corticosteroids.

## POTENCY

### Factors Determining Potency

Potency of TCS reflects intensity of clinical effects and depends on several factors:

- ***Structure of TCS:*** TCS molecules have inherent differences in potency based on their structure which determine the following.
  - *Lipophilicity*: Thereby increased percutaneous absorption due to their ability to penetrate the stratum corneum, e.g. esterification at 21-position of betamethasone results in formation of betamethasone-21-valerate which is more lipophilic so has better percutaneous absorption.
  - *Affinity to GCR*:
    - Esterification at 17-position of betamethasone results in formation of betamethasone-17-valerate, which is 125 times more potent than betamethasone because of greater binding to GCR.
    - Chlorination at 21-position produces clobetasol propionate which has increased binding to GCR.
  - *Metabolism in skin*: TCS get metabolized mainly by intraepidermal de-esterification. It may be one of the causes for tachyphylaxis. Reduced de-esterification at 17-position increases potency, e.g. by chlorination at 21-position in clobetasol propionate and by fluorination at 6- and 9-position in difluorosone diacetate.
  - *Specificity for a particular action*: Halogenation at 6-, 9- or 21-position increases potency especially antiproliferative effect which can be utilised as targeted therapy in psoriasis and chronic lichenified eczema, e.g. clobetasol propionate.
- ***Concentration of TCS*:**
  - This is logical. The target for TCS is the viable epidermis and dermis and clinical response to a formulation is directly proportional to the concentration of TCS achieved at target site. A comparative study of skin concentrations after topical *vs* oral corticosteroid treatment found that most TCS have the potential to achieve greater effective drug levels in the superficial layers of skin than achieved by standard dose of oral prednisolone. Therefore, the apparent greater efficacy of oral corticosteroids may be due in part to poor patient compliance with topical therapy.
  - Stratum corneum also act as a reservoir for TCS which is TCS potency dependant. Experimental studies in rabbit skin have shown a reservoir effect of:
    - 4 days for clobetasol propionate 0.5% and mometasone furoate 0.1%.
    - 2 days for fluticasone propionate 0.005% and betamethasone valerate.
    - 1 day for hydrocortisone butyrate 0.1%.[3]
- ***Vehicle and formulations*:** Active TCS molecule is dissolved in a vehicle to allow easy dispersion and adequate release of the drug. They alter therapeutic and adverse actions of TCS by modulating their pharmacokinetics.
  - Several formulations of TCS are available including cream, ointment, foam, shampoo, lotion and gel. Oil-in-water preparations such as creams and lotions

are created with emulsifying agents. Emulsifiers help to distribute the drug evenly on the skin surface.
  - Occlusive vehicles like ointments enhance a TCS molecule's percutaneous absorption by increasing hydration[b] of stratum corneum. This makes ointment more potent than a cream.
  - Humectants are added in oil-in-water preparations to maintain the optimal water content.
  - Solvents are used in lotions, solutions, gels, and sprays to decrease viscosity. Solvents such as propylene glycol and ethanol (which have high solubility for TCS molecule) enhance potency by increasing percutaneous absorption.
- ***Occlusion:*** Penetration of TCS is greatly increased (up to 10 times) by occlusion. Methods of occlusion include bandages, gloves and socks, cling films and wet wraps. Hydrocolloid dressings and paste bandages with TCS incorporated are also available. However, whole body occlusion of TCS has fallen out of favor because of adverse effects.
- ***Site of use:*** Different sites have different levels of absorption of TCS, correlating inversely with thickness of stratum corneum and directly with vascularity of the area (Table 1.1).
- ***Condition of skin*:**
  - Inflamed skin (e.g. eczematous skin) tends to absorb TCS more readily while thick hyperkeratotic lesions absorb TCS less readily (e.g. lichen simplex chronicus).
  - Sites which are naturally occluded (axillae, groin) also are more susceptible to developing side effects because of greater percutaneous absorption (due to hydration and occlusion).

**Table 1.1: Site related absorption of TCS**

| *Site* | *Relative levels of absorption* |
|---|---|
| Fore arm | 1 |
| Palm | 0.8 |
| Axilla | 3.6 |
| Sole | 0.1 |
| Ankle | 0.4 |
| Back | 1.7 |
| Scalp | 3.5 |
| Eyelids | 56 |
| Forehead | 06 |
| Scrotum | 42 |

## Assessing Potency

Though there are several assays available to compare the potency of TCS, the most frequently used is the vasoconstriction assay and usually a second assay (like efficacy in a skin disease, e.g. psoriasis) is used to validate it (Table 1.2).

## Classification of Potency TCS[4]

There are two important systems of classification of potency of TCS:

- ***British system*:** Classifies TCS into 4 classes. According to British National Formulary class I is the most potent and class IV the least potent[c] (Table 1.3).

[b]Hydration enhances absorption by four times.
[c]However, in continental Europe, class IV is regarded as the most potent and class I as the least potent.

- ***American system*:** Classifies TCS into 7 classes with class I being the most potent and class VII being the least potent (Table 1.4).

**Table 1.2: Methods of assessing potency of TCS**

| *Using laboratory animals/cell cultures* | *Using human volunteers* |
|---|---|
| **Assays of anti-inflammatory potency**<br>• *Mitotic index suppression*: Hairless mouse<br>• *Antigranuloma assay*: Rat<br>• *Croton oil inflammation assay*: Rat<br>• *6-chloro-2–4-dinitrobenzene inflammation*: Guinea pig | • *Vasoconstrictor assay*[d]<br>• *Artificially induced inflammation*<br>– Tape stripping<br>– Ultraviolet light<br>– Mustard oil<br>– Nitric acid<br>– Tetrahydrofurfuryl alcohol<br>– Nickel-induced positive patch tests<br>– Dimethyl sulfoxide<br>– Sodium hydroxide<br>• *Efficacy in skin disease*: Psoriasis |
| **Assays of atrophogenicity**<br>• Inhibition of fibroblast growth *in vitro*<br>• Neutral red release assay<br>• Mouse tail epidermis<br>• Transgenic mouse model expressing human elastin promoter/chloramphenicol acetyl transferase<br>• Guinea pig epidermis | • Micrometer calipers<br>• Histopathologic examination of skin biopsies<br>• X-ray radiography<br>• Pulsed ultrasound<br>• Optical coherence tomography |

[d]**Vasoconstriction assay:** It is the assay of choice because it correlates well with clinical efficacy and is reproducible by same and other observers in completely different settings, locations, climates, and subjects. *Disadvantages*: It is subjective and only measures one aspect of TCS effects and there is no 'hard copy' for subsequent comparison, analysis, and validation. *Method*: Formulation of test corticosteroid in 95% alcohol is applied to volar surface of a normal volunteer's forearm and test area is covered with an occlusive dressing for 16 hours after alcohol is allowed to evaporate. The tested area is assessed for vasoconstriction 2 hrs later on a blind basis by an experienced investigator using a multiple unit scale (0–3 or 0–4). *Exceptions*: Aclometasone ointment and hydrocortisone valerate cream, both demonstrate greater vasoconstrictive activities than clinical efficacy.

**Table 1.3: British national formulary classification of potency of TCS**

| *Class* | *Potency* | *Drugs* | *Conc* | *Formulation* |
|---|---|---|---|---|
| **Class I** | Very potent | Clobetasol propionate | 0.05% | Cream, ointment, lotion |
| **Class II** | Potent | Betamethasone dipropionate | 0.05% | Cream, ointment, lotion |
| | | Betamethasone valerate | 0.1% | Cream, ointment, lotion |
| | | Beclomethasone dipropionate | 0.025% | Cream, ointment, lotion |
| | | Fluocinolone acetonide | 0.025% | Cream, ointment, lotion |
| | | Fluticasone propionate | 0.05% | Cream |
| | | Fluticasone propionate | 0.005% | Ointment |
| | | Mometasone furoate | 0.1% | Cream, ointment, lotion |
| **Class III** | Moderate | Desonide | 0.05% | Cream, lotion |
| | | Clobetasone butyrate | 0.05% | Cream |
| **Class IV** | Mild | Hydrocortisone acetate | 1.0% | Cream |
| | | Hydrocortisone aceponate | 0.127% | Cream |

**Table 1.4: American system of classification of TCS**

| *Steroid* | *Concentration* | *Formulations* |
|---|---|---|
| **Class I (Superpotent)** | | |
| • Clobetasol propionate | 0.05% | All formulations except scalp solution |
| • Betamethasone dipropionate | 0.05% | Ointment, gel |
| • Halobetasol propionate | 0.05% | Cream, ointment |
| • Diflorasone diacetate | 0.05% | Ointment |
| **Class II (Potent)** | | |
| • Clobetasol propionate | 0.05% | Scalp solution |
| • Betamethasone dipropionate | 0.05% | Cream, ointment |
| • Desoximetasone | 0.25% | Cream |
| • Mometasone furoate | 0.1% | Ointment |
| • Triamcinoloe acetonide | 0.5% | Ointment |
| • Halcinonide | 0.1% | Cream, gel, ointment, solution |
| • Fluocinonide | 0.5% | Gel |
| **Class III (Upper mid potency)** | | |
| • Betamethasone dipropionate | 0.05% | Cream |
| • Betamethasone valerate | 0.1% | Ointment |
| • Fluticasone propionate | 0.005% | Ointment |
| • Triamcinolone acetonide | 0.1% | Ointment |
| | 0.5% | Cream |
| **Class IV (Mid potency)** | | |
| • Betamethasone valerate | 0.12% | Foam |
| • Desoximetasone | 0.05% | Cream |
| • Fluocinolone acetonide | 0.025% | Ointment |
| • Hydrocortisone valerate | 0.2% | Ointment |
| • Mometasone furoate | 0.1% | Cream |
| **Class V (Lower mid potency)** | | |
| • Betamethasone dipropionate | 0.05% | Lotion |
| • Betamethasone valerate | 0.1% | Cream |
| • Fluticasone propionate | 0.05% | Cream, lotion |
| • Fluocinolone acetonide | 0.25% | Cream |
| • Hydrocortisone butyrate | 0.1% | Ointment, cream, lotion |
| • Hydrocortisone valerate | 0.2% | Cream |
| • Triamcinolone acetonide | 0.025% | Ointment |
| | 0.1% | Lotion |
| **Class VI (Mild potency)** | | |
| • Desonide | 0.05% | Gel, ointment, cream, lotion, foam |
| • Fluocinolone acetonide | 0.01% | Cream, solution |
| • Betamethasone valerate | 0.1% | Lotion |
| • Triamcinolone acetonide | 0.025% | Cream, lotion |
| **Class VII (Least potent)** | | |
| • Hydrocortisone acetate | 1% | Cream, ointment, foam |
| • Dexamethasone sodium phosphate | 0.1% | Cream |
| • Methylprednisolone acetate | 0.25% | Cream |

## INDICATIONS

TCS are one of the most commonly used dermatological drugs with good evidence to support their use in several skin disease (Table 1.5).

### Atopic Dermatitis (AD)[6]

- Patient education about skin care is the cornerstone of management of AD. TCS are the first line for treating inflammation and pruritus associated with AD that is unresponsive to appropriate skin care and moisturizers. Table 1.6 provides a brief summary of a few recent randomized trials on TCS in dermatitis including AD.
- In practice, there is a huge variation in prescribing habits of TCS (e.g. quantity, frequency and duration of therapy) among dermatologists. The various strategies used include:
  - Using prolonged treatment with mild potency steroid preparations, because AD is a highly steroid responsive dermatoses.
  - Starting treatment with potent TCS in order to induce rapid remission, followed by a relatively quick tapering down of potency, as the dermatitis improves.
  - Using short bursts of potent TCS followed by moisturizers alone until relapse occurs.
  - However, recent studies suggest that once control of AD is achieved with a daily regimen of TCS, long-term remissions can be sustained in a subset of patients with twice weekly applications of potent TCS (fluticasone) to areas that have healed but are prone to developing eczema (Fig. 1.2), with patients/caretakers being instructed to follow instructions carefully to avoid potential side effects.[7]

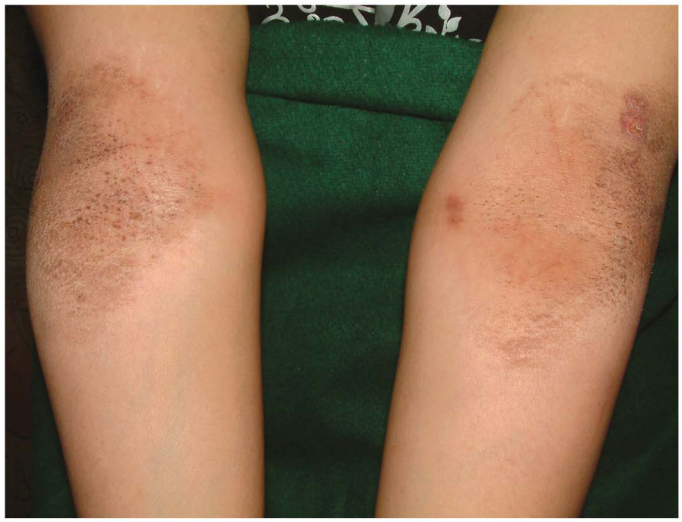

**Fig. 1.2:** TCS are the first line agents for treating inflammation and pruritus associated with AD that is unresponsive to good skin care and moisturizers. In this patient, the acute flare of AD was controlled with a daily regimen of betamethasone valerate cream and long-term remission was sustained with twice weekly applications of diluted betamethasone (with cold cream 1:1) to areas prone to developing eczema immediately after a bath while the skin was still moist.

**Table 1.5: Grade of evidence and potency of TCS used in dermatological diseases[5]**

| *Evidence grade* | *Indication* | *Potency of TCS (British)* |
|---|---|---|
| **A:** Double blind RCTs | Atopic dermatitis | Mild, moderate, potent |
| | Psoriasis | Mild, moderate, potent, very potent |
| | Vitiligo | Potent, very potent |
| | Seborrheic dermatitis | Mild, moderate |
| | Pompholyx | Potent, very potent |
| | Lichen sclerosus | Potent, very potent |
| | Lichen simplex | Potent, very potent |
| | Aphthous stomatitis | Potent |
| **B:** Clinical trials | Alopecia areata | Potent, very potent |
| | Bullous pemphigoid | Potent, very potent |
| | Allergic contact dermatitis | Moderate, potent |
| | Cutaneous T cell lymphoma | Moderate, potent |
| | Discoid lupus erythematosus | Potent, very potent |
| | Polymorphic eruptions of pregnancy | Potent |
| | Pruritus ani | Mild, moderate |
| | Pruritus valvae | Moderate, potent |
| **C:** Small trials or >20 cases | Actinic prurigo | Potent, very potent |
| | Chronic actinic dermatitis | Moderate, potent |
| | Chronic irritant dermatitis | Mild, moderate, potent, very potent |
| | Nummular dermatitis | Potent, very potent |
| | Geographical tongue | Potent |
| | Hailey Hailey disease | Mild, moderate, potent |
| | Juvenile planter dermatosis | Moderate, potent |
| | Lichen planus | Potent, very potent |
| | Pemphigus gestationis | Potent, very potent |
| | Pretibial myxedema | Potent |
| | Sarcoidosis | Potent |
| | Sweet's syndrome | Potent |
| | Urticaria pigmentosa | Potent, very potent |
| **D:** At least 5 cases | Grover's disease | Potent |
| | Lichen planopilaris | Potent, very potent |
| | Necrobiotic lipoidica | Potent |
| | Pyoderma gangrenosum | Potent, very potent |
| | Scleromyxoedema | Potent |
| | Infantile hemangioma | Very potent |
| | Subcorneal pustular dermatosis | Moderate, potent |
| | Prurigo nodularis | Potent, very potent |
| **E:** <5 cases reported | Granuloma annulare | Potent, very potent |
| | Granuloma faciale | Moderate, potent |
| | Lichen nitidus | Potent |
| | Lymphocytoma cutis | Potent |
| | Lymphomatoid papulosis | Potent, very potent |
| | Morphoea | Potent |
| | Pityriasis rosea | Moderate, potent |
| | Subacute cutaneous lupus erythematosus | Moderate, potent |

**Table 1.6: Summary of a clinical trials on use of TCS in AD**

| *Authors, year of publication* | *Drugs* | *Result* |
|---|---|---|
| Prado de Oliveira *et al*, 2002 | Mometasone furoate 0.1% BD *vs* Desonide 0.5% OD | Mometasone group showed better response |
| Hanifin *et al*, 2002 | Intermittent fluticasone propionate or vehicle, OD 4 d/wk × 4 weeks followed by OD 2 d/wk | AD relapse 7.7 times less likely with twice-a-week fluticasone propionate than with emollients alone |
| Torok *et al*, 2003 | Clocortolone pivalate 0.1% + tacrolimus 0.1% BD *vs* Clocortolone pivalate 0.1% BD *vs* Tacrolimus 0.1% BD | Combination therapy was superior to TCS or tacrolimus alone arms |
| Kirkup *et al*, 2003 | Fluticasone propionate *vs* Hydrocortisone 1% cream *vs* Hydrocortisone butyrate 0.1% cream | Fluticasone propionate was more effective than hydrocortisone 1% in both acute and maintenance treatment of AD |
| Beattie and Lewis-Jones, *2004* | Hydrocortisone 1% OD as wet wrap *vs* Hydrocortisone 1% BD | Twice a day hydrocortisone + emollients not statistically significantly inferior than wet wrap therapy in moderate AD |
| Hebert *et al*, 2007 | Desonide 0.05% *vs* Vehicle BD | Desonide 0.05% was statistically significantly better than vehicle |
| Peserico *et al*, 2008 | Emollient ± methylprednisolone aceponate 0.1% cream twice weekly | Treatment with methylprednisolone aceponate twice weekly + emollient had a 3.5 fold lower risk of relapse than treatment with emollients alone |
| Glazenburg *et al*, 2009 | Fluticasone propionate 0.005% ointment BD *vs* Placebo | 87% children had remission in 4 week period; twice weekly fluticasone propionate reduced risk of relapse in moderate-severe AD |
| Rubio *et al*, 2013 | Fluticasone propionate cream 0.05% BD *vs* Vehicle cream BD | Fluticasone group had 2.7 times lower risk of relapse than vehicle group |

- Another technique of TCS application is wet wrap dressings, used specially in cases with severe extensive disease to avoid systemic administration of steroids. In children with severe refractory AD, 5%, 10%, and 25% dilutions of fluticasone propionate 0.05% cream proved highly efficacious, irrespective of dilution, when applied under wet-wrap dressings. Improvement occurred mainly during the first week, and the only significant adverse effect was folliculitis.[8]

- Regarding frequency of application, a systematic review found no clear differences in outcomes between once-daily and more frequent application of TCS.[9]

- A systemic review on safety of TCS in AD found that although some systemic exposure does occur, clinically significant changes appear to be uncommon, and systemic complications are rare when medications are used properly.[10]

## Nummular Dermatitis

- Management of nummular dermatitis (Fig. 1.3) is similar to other dermatitis and TCS along with emollients are the mainstay of treatment.
- Moderate-potency to potent TCS (sometimes along with topical antibiotics) are used at least initially and may be weaned with topical immunomodulators like tacrolimus or pimecrolimus as the patient responds.
- Severely pruritic and chronic lichenified lesions respond better to potent agents, but this seems a safe option as the lesions are limited and rarely affect thin skin sites such as face or flexures.

## Psoriasis[6]

TCS are of established value in psoriasis. Potent and very potent TCS are the most effective topical monotherapy for localized disease based on their cost-effectiveness (Table 1.7).

- ***Indications:***
  - *Chronic plaque psoriasis*:
    - Localized diseases: As a standalone therapy a potent (or very potent if lesions are thick) TCS is used carefully on the lesions (Fig. 1.4a and b).
    - Widespread disease: Mild or moderate potency TCS is used as an adjunct to systemic therapy.

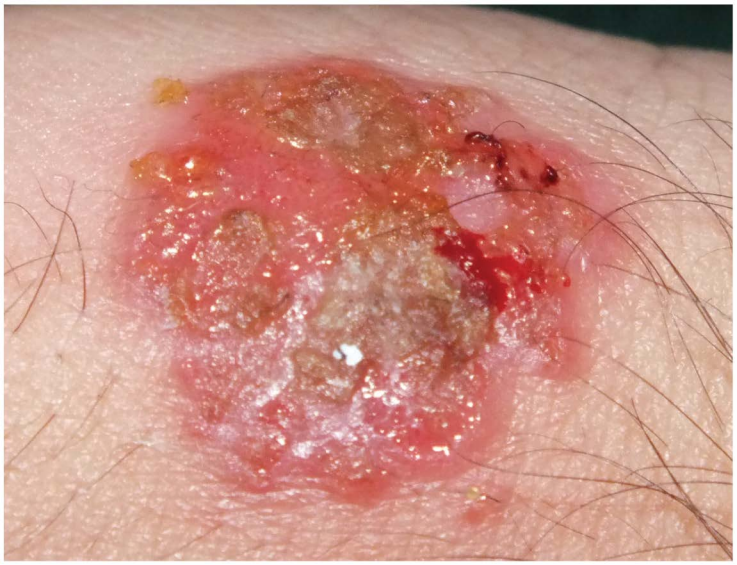

**Fig. 1.3:** TCS are first line of treatment for nummular dermatitis. In this patient a moderate potency steroid antibiotic combination was used for 3 weeks. Always rule out underlying atopy in these patients.

**Table 1.7: Summary of clinical trials on use of TCS in chronic plaque psoriasis**

| *Authors, year of publication* | *Drugs* | *Result* |
|---|---|---|
| Stein *et al*, 2001 | Betamethasone valerate foam *vs* Placebo BD | Betamethasone valerate foam was superior to placebo |
| Green & Sadoff, 2001 | Tazarotene 0.1% *vs* Tazarotene + high-potency TCS (fluocinonide 0.05%, mometasone 0.1% or diflorasone 0.05%) *vs* Tazarotene + mid-high potency TCS (betamethasone 0.05% or fluticasone 0.005%, or diflorasone 0.05%). All applied OD | Betamethasone 0.05% was best performing steroid. Mometasone + tazarotene was best tolerated option |
| Gottlieb *et al*, 2003 | CP foam 0.05% BD *vs* Placebo | In CP group, 68% achieved PGA 0/1 *vs* 21% in placebo group (p <0.001) |
| Decroix *et al*, 2004 | CP lotion *vs* Vehicle BD | CP lotion was efficient, safe and well tolerated |
| Lowe *et al*, 2005 | CP lotion *vs* CP emollient cream *vs* Vehicle | CP lotion was comparable to CP emollient cream and significantly more effective than vehicle |
| Koo *et al*, 2006 | CP foam + calcipotriene ointment *vs* CP foam *vs* Calcipotriene ointment | Combination therapy was better than either agent. Weekend maintenance with CP was better than maintenance with placebo |
| Jarratt *et al*, 2006 | CP spray 0.05% *vs* Vehicle | CP spray 0.05% was effective and safe |
| Angelo *et al*, 2007 | Tazarotene 0.1% *vs* CP 0.05% | At 12 weeks, there was 100% response in CP group *vs* 88% in tazarotene group. |
| Mraz *et al*, 2008 | CP 0.05% spray *vs* CP foam | There was 64% reduction in BSA involvement with CP spray *vs* 25% with CP foam (p <0.01), indicating spray was better than foam |

**Note:** CP: Clobetasol propionate.

- *Hyperkeratotic and lichenified psoriasis*: Salicylic acid (3–6%) is often added to potent/very potent TCS to treat thick hyperkeratotic (Fig. 1.5) and lichenified psoriasis.
- *Scalp psoriasis:* Potent and very potent TCS are also the most effective therapy for scalp psoriasis[11] (Fig. 1.6a). If lesions are thick, then TCS are often combined with salicylic acid (3–6%) and occlusion improves response.
- *Palmoplantar psoriasis:* Potent and very potent TCS are also the most effective therapy for palmoplantar psoriasis (Fig. 1.6a), but it is necessary to ask the patient to hydrate the skin by soaking the affected part and immediately applying the medication carefully, avoiding inadvertent rubbing of the excess medication on dorsal aspect (Fig. 1.6b), otherwise this overzealous treatment results in hypopigmentation of dorsal aspect of digits (Fig. 1.6c).

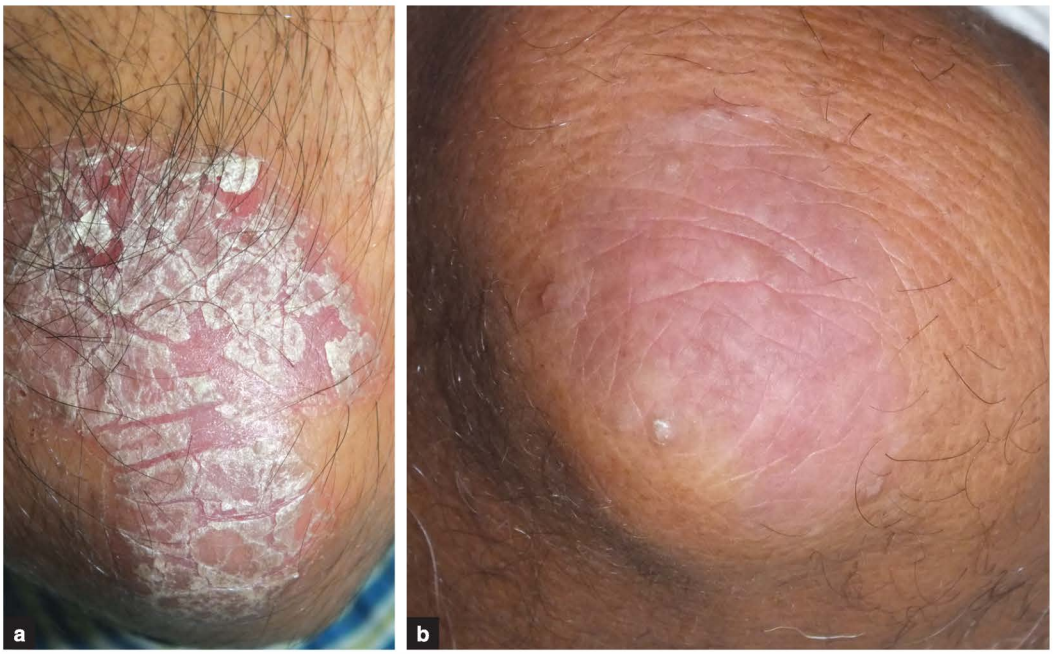


**Fig. 1.4: Localized psoriasis: (a) Pre-treatment:** In this patient, who had localized but recurrent disease (when ever he stopped therapy) involving only elbows and knees, a very potent steroid (clobetasol propionate 0.05%, in ointment base) was used taking care to avoid application to surrounding skin. **(b) Post-treatment:** Improvement was seen in 4 weeks and patient was maintained on weekend therapy with betamethasone valerate with no relapses. Such a patient can also be treated with a combination of calcipotriol and TCS.

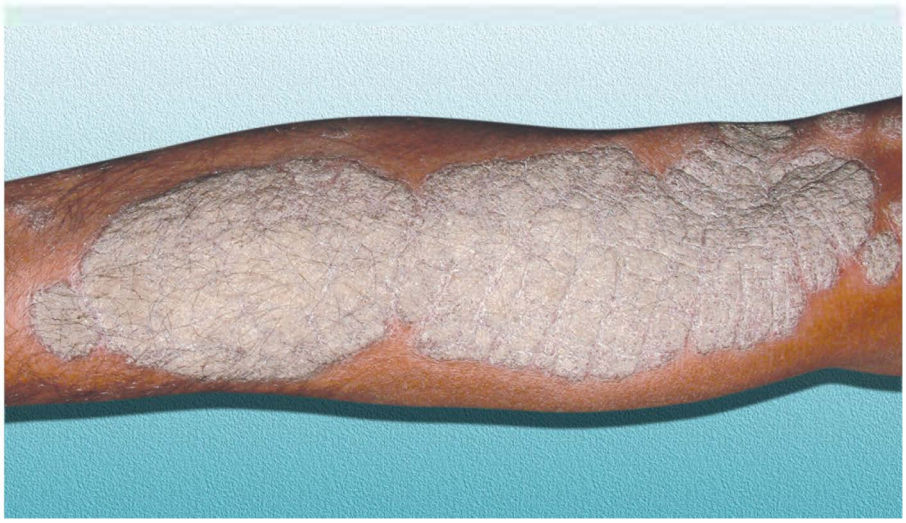

**Fig. 1.5: Hyperkeratotic psoriasis:** This patient, who had a localized hyperkeratotic lesion was treated with a combination of a very potent TCS (clobetasol propionate 0.05%)—salicylic acid (3%) combination in ointment base used carefully to avoid application to surrounding normal skin after moistening the lesion using a wet towel. Lesion flattened in 4 weeks and potency of steroid was reduced to a moderate potency formulation. Improvement was achieved in 8 weeks and patient was maintained on weekend therapy with betamethasone valerate.

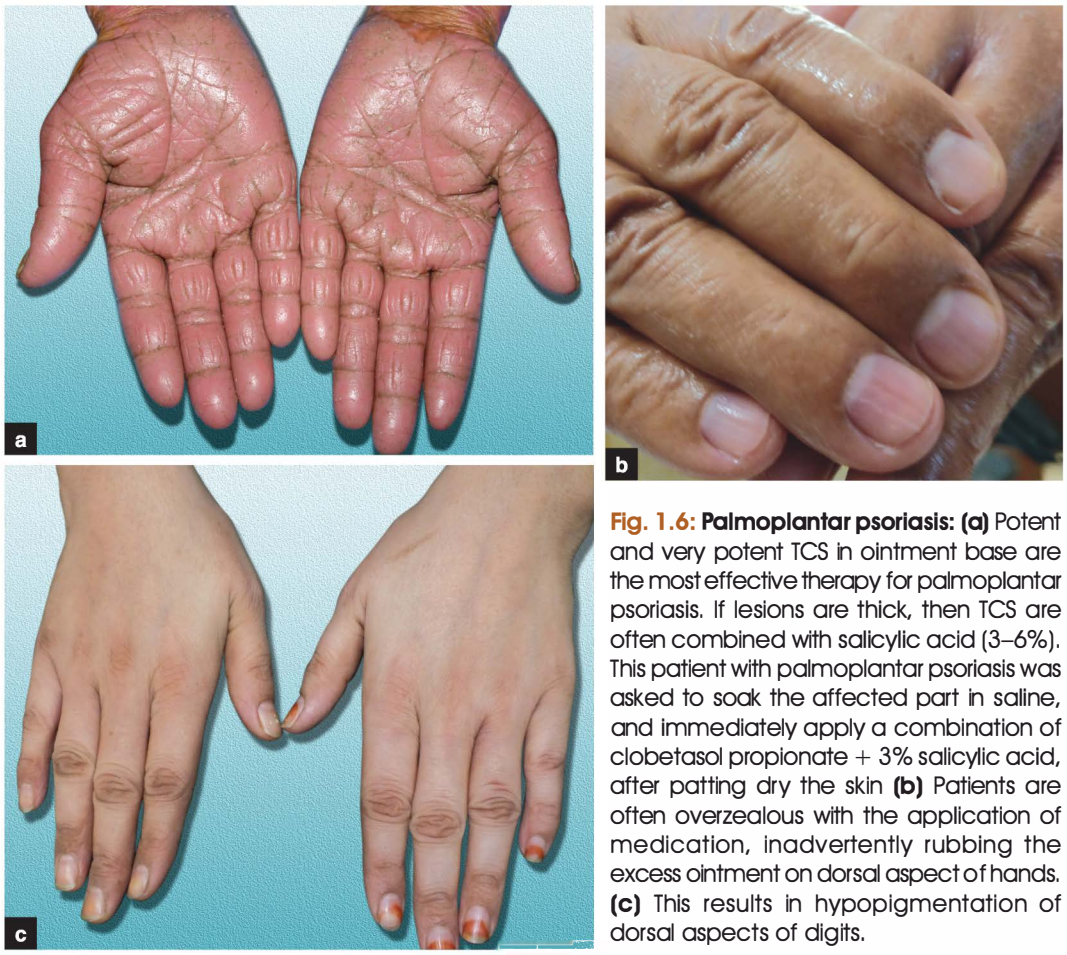


**Fig. 1.6: Palmoplantar psoriasis: (a)** Potent and very potent TCS in ointment base are the most effective therapy for palmoplantar psoriasis. If lesions are thick, then TCS are often combined with salicylic acid (3–6%). This patient with palmoplantar psoriasis was asked to soak the affected part in saline, and immediately apply a combination of clobetasol propionate + 3% salicylic acid, after patting dry the skin **(b)** Patients are often overzealous with the application of medication, inadvertently rubbing the excess ointment on dorsal aspect of hands. **(c)** This results in hypopigmentation of dorsal aspects of digits.

- *Flexural psoriasis:* Mild-to-moderate potency TCS are also first line of therapy in flexures (Fig. 1.7a) and genitalia where other topical treatments may irritate. Very potent TCS should not be used in flexures as it may lead to side effects like dermatophytic infections and striae (Fig. 1.7b).
- *Unstable, erythrodermic and generalized pustular psoriasis*: Mild TCS or TCS diluted with emollients are often used as adjunct to systemic therapy.
- *Resistant psoriasis*: Intralesional CS can be used in small resistant plaques, for instance on the backs of hands and knuckles and the effect may be long lasting and repetition of the injection unnecessary for several months. In the treatment of psoriasis of the fingernails, the nail fold can be injected, but results are often disappointing and the procedure may be painful.

- ***Formulations:***
  - Potent and very potent steroids in cream/ointment formulation (depending on thickness of lesions) are the most effective treatment for localised psoriasis, but may be associated with side effects.

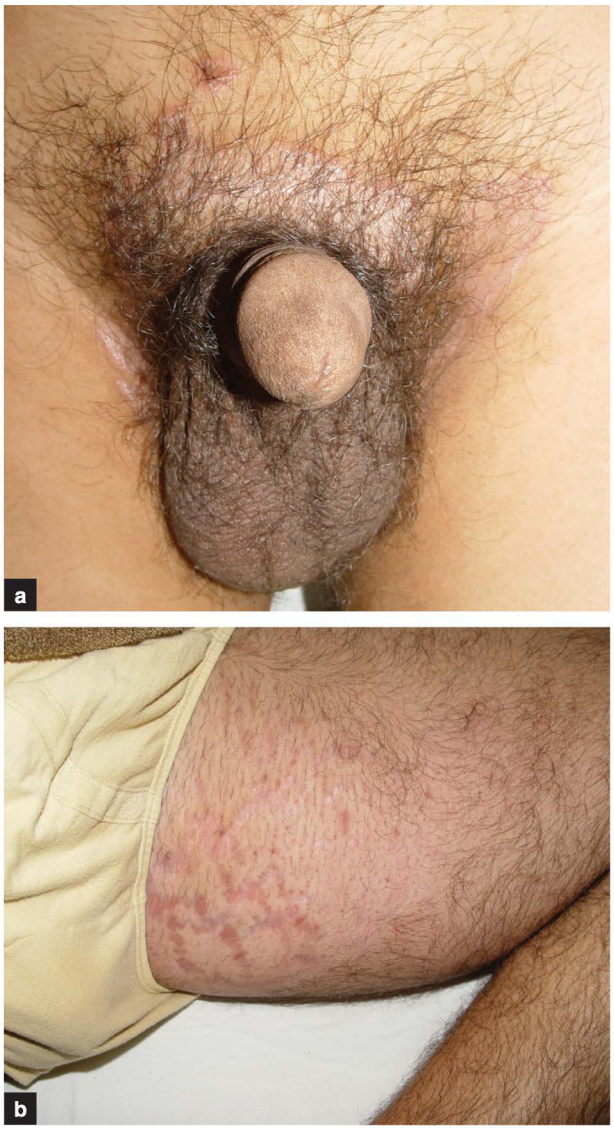


**Fig. 1.7: Flexural psoriasis: (a)** Mild to moderate potency TCS are first line of therapy at sites such as flexures and genitalia where other topical treatments can induce irritation. **(b)** Very potent TCS should not be used in flexures as it may lead to side effects like striae.

  - Mild-to-moderate potency TCS are the treatment of choice for psoriasis on the face and neck.
  - Newer formulations of TCS, particularly foams, are easier to apply than traditional creams or ointments and can be used for scalp, truncal or limb psoriasis.
- ***Dosing:*** It remains unclear whether once or twice daily applications should be recommended. However, it is generally agreed that use of very potent TCS should be limited to 2–4 weeks and less than 50 g/week. Very potent TCS should not be occluded and should not be used on the face or intertriginous sites.

- ***Response:*** Improvement is usually achieved within 4–6 weeks but patients usually require maintenance treatment consisting of intermittent applications (often restricted to the weekends). But frequency, as well as duration, should be tapered down in maintenance phase because of cutaneous and systemic adverse effects of TCS.
- ***Advantages:*** TCS generally lack irritancy, do not stain skin or clothing and have the merits of ease of application and are frequently combined with other topical agents to counteract irritancy.
- ***Disadvantages:***
  - *Side effects:* Potential side effects of TCS are well known and include cutaneous atrophy (risk less in psoriasis than in AD) and systemic absorption, although there is a lack of data about the magnitude of these risks. However, it is prudent to limit the use of potent TCS to stable plaque psoriasis affecting limited areas.
  - *Psoriasis specific disadvantages:*
    - Tachyphylaxis to treatment with TCS is a suspected, but debatable phenomenon in psoriasis.
    - Potent TCS also do not induce a lasting remission, unlike tar or dithranol.
    - Another concern is that when TCS are discontinued, patients may rebound, sometimes with disease worse than it was prior to treatment (pustular lesions).
- ***Combination therapy:***
  - *Salicylic acid*: TCS are often combined with salicylic acid 3–6% in an ointment formulation to treat thick hyperkeratotic and lichenified psoriasis and palmoplantar lesions. Similar combination in a lotion formulation is used to treat scalp psoriasis.
  - *Calcipotriol*: Combination of a potent TCS with calcipotriol provides the most effective strategy for topical treatment of limited plaque psoriasis over a short period of time.

### Vitiligo

- ***Indications:*** TCS are the first-line therapy for localized vitiligo and are highly recommended for small lesions and for use in children (Table 1.8).
- ***Dosing:*** Vitiligo is a moderately steroid responsive dermatoses and a potent/very potent TCS (e.g. clobetasol propionate ointment, 0.05%) is used once daily for 4 weeks and application gradually tapered to a lower potency TCS (e.g. hydrocortisone butyrate, 0.1% cream).[12]
- ***Advantages*:** Ease of application, high compliance rate, and low cost are advantages of using TCS. Compared with PUVA, which promotes a predominantly perifollicular pattern of repigmentation, TCS result in more diffuse repigmentation (Fig. 1.8) which occurs more quickly but is less stable.

**Table 1.8: Summary of a clinical trials on use of TCS in vitiligo**

| *Authors, year of publication* | *Drugs* | *Result* |
|---|---|---|
| Lim-Ong *et al*, 2005 | CP 0.05% and NB-UVB *vs* Placebo and NB-UVB | CP + NBUVB induced earlier repigmentation but over all repigmentation comparable in both groups. |
| Sanclemente *et al*, 2008 | Betamethasone 0.05% *vs* Topical catalase/dismutase superoxide | Good repigmentation in both groups at 10 months |
| Sassi *et al*, 2008 | 308 nm laser phototherapy twice weekly + hydrocortisone 17-butyrate cream BD *vs* 308 nm laser phototherapy twice weekly alone | At 12 wks laser phototherapy twice weekly + hydrocortisone 17-butyrate cream BD superior in repigmentation and PGA scores ($p = 0.0087$) |
| Kose *et al*, 2010 | Mometasone 0.1% *vs* Pimecrolimus 1% | Mometasone cream effective in vitiligo on any part of body, while pimecrolimus was effective only on face |
| Akdeniz *et al*, 2014 | Calcipotriol + NB-UVB + betamethasone *vs* NB-UVB + calcipotriol *vs* NB-UVB | Combination of topical calcipotriol + NB-UVB + betamethasone showed superior repigmentation (63.3%) *vs* NB-UVB alone (46.7%) |

**Note:** CP: Clobetasol propionate.

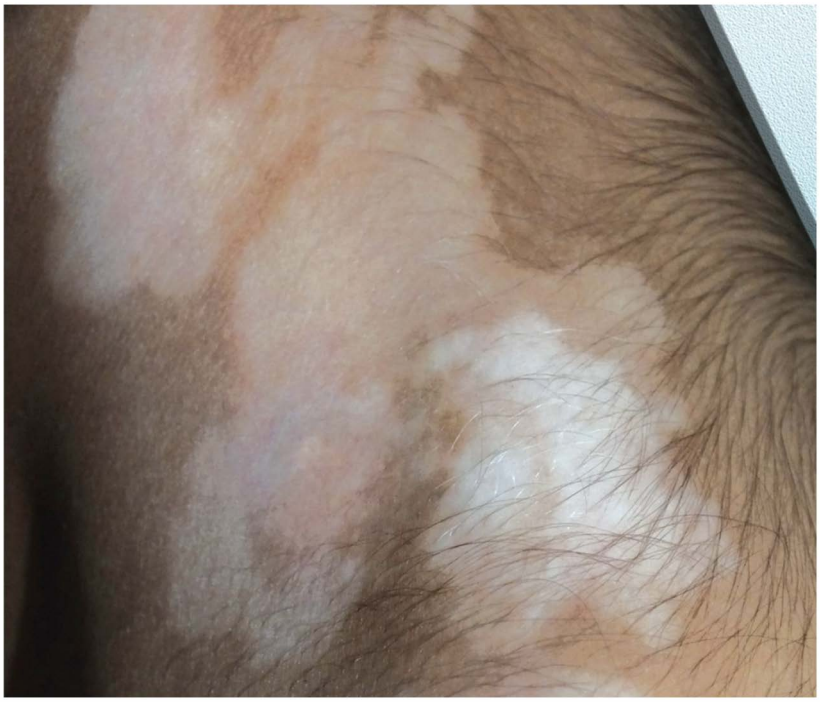

**Fig. 1.8: Vitiligo:** TCS are the first-line therapy for localized vitiligo and are highly recommended for small lesions and for use in children. TCS result in more diffuse repigmentation, which occurs more quickly but is less stable.

Steroid-treated repigmented vitiligo skin showed marked repopulation by functional melanocytes which appear dendritic and DOPA-positive, and contain many melanosomes of normal size and shape.[13]

- ***Disadvantages:***
  - Caution is necessary when using TCS around the eyelids, as they can increase intraocular pressure and exacerbate glaucoma.
  - TCS induced pigmentation is less stable and recurrence after cessation of treatment is not uncommon.
  - TCS induced other side effects.
- ***Combination therapy:*** TCS + UVB, TCS + calcineurin inhibitors, TCS + vitamin D analogs may be beneficial in some cases, as two agents act synergistically on pigment restoration and on immune suppression, at lower individual doses, thus potentially minimizing side effects.

### Seborrheic Dermatitis (SD)

- TCS and topical antifungals, either alone or in combination, are the mainstay of therapy in SD. When topical antifungal monotherapy fails, it is recommended that a short course of mild to moderately potent TCS be added to control acute flares and improve results.
- SD of scalp is frequently treated with combination of TCS (even clobetasol propionate) and salicylic acid in a lotion formulation, applied at night with shampooing the next morning. In very hyperkeratotic lesions (Fig.1.9a), patient is asked to apply TCS in lotion (initially even an ointment, though cumbersome to use) formulation and occlude the scalp with a shower cap overnight (Fig.1.9b).
- The side effects of TCS preclude their long (even short term) use over face especially in thin-skin areas such as eyelids and therefore, topical calcineurin inhibitors (tacrolimus and pimecrolimus) though not yet approved for use in SD are emerging as effective alternatives.[14]

### Pompholyx

- Potent and very potent TCS are the first line therapy. They are often more effective if used under occlusion, although this approach may increase the chance of side effects.
- Overzealous or inadvertent application of the TCS on the dorsal aspect of hands often results in hypopigmentation and atrophy of these areas.

### Lichen Sclerosus (LS)

- Potent and very potent TCS, when used under supervision and for finite duration, are the first line of treatment for LS in adults as well as in children in both sexes.[15]
- There are no RCTs comparing formulations or frequency of application of TCS in LS, but the general recommendation is to use clobetasol propionate 0.05%

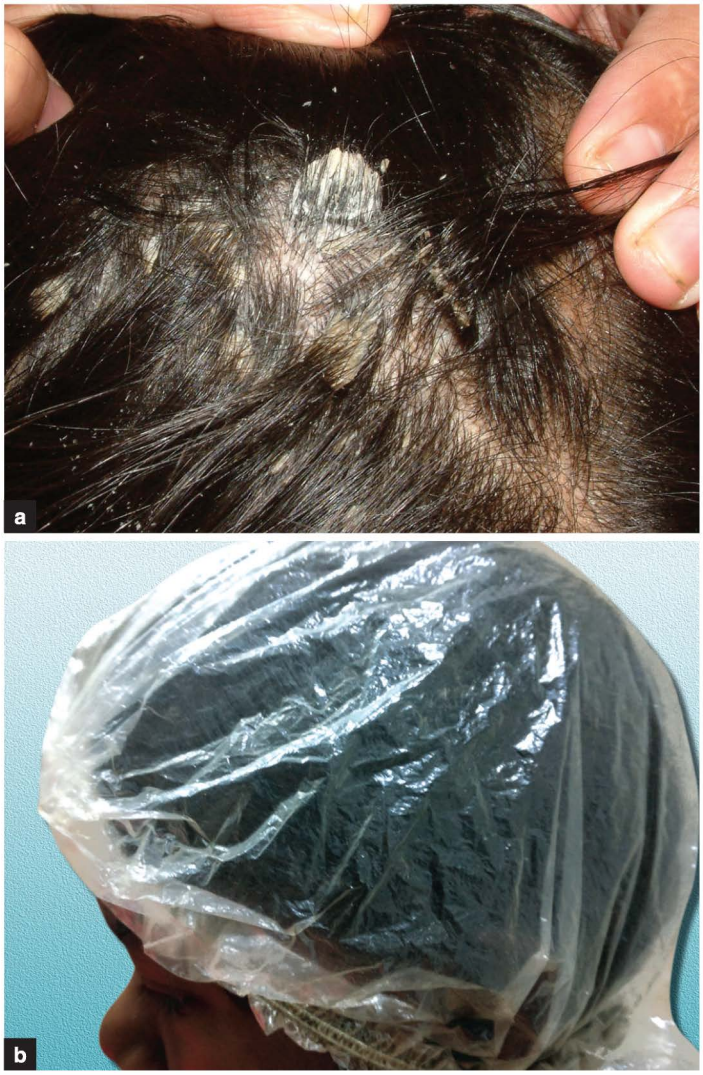


**Fig.1.9: Seborrheic dermatitis of scalp. (a)** This patient had hyperkeratotic lesions (pityriasis amiantacea) which is frequently treated with combination of clobetasol propionate and salicylic acid in a lotion (initially even ointment) formulation, applied over night with shampooing of scalp next morning. **(b)** To improve the efficacy, TCS can be applied on scalp under occlusion using a shower cap.

ointment once a day for a month, on alternate days for a month, and then twice weekly for a further month, with a 30 gram tube lasting at least 3 months in an adult and 6 months in a child. Patient can thereafter be weaned off to a less potent steroid or topical calcineurin inhibitor.

- Complications of use of TCS in genital LS include development of anogenital warts (Fig.1.10) and reactivation of genital herpes (GH), along with secondary candidal and bacterial infection. It is recommended that those with history of GH should be prescribed prophylactic acyclovir.[16]

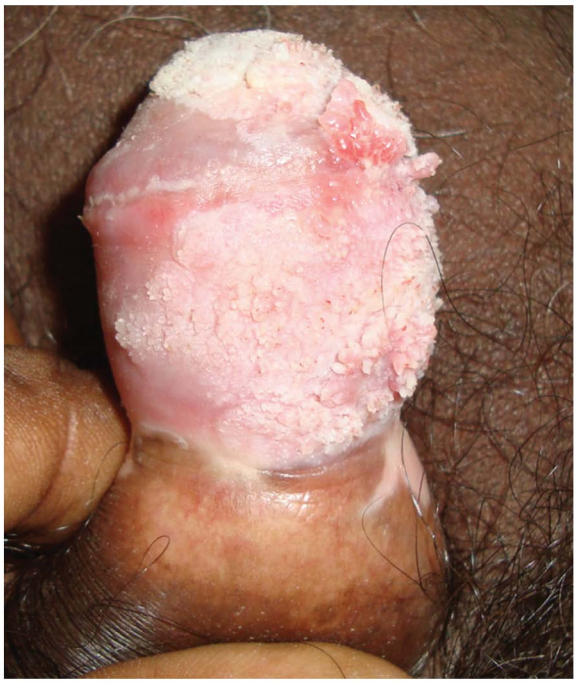

**Fig. 1.10: Genital lichen sclerosus:** Potent and very potent TCS are the first line of treatment for genital LS but need to be used under supervision and for finite duration. This patient with genital LS had used very potent TCS for several years and developed condyloma acuminatum-like lesions. Other infections which can develop in this scenario include reactivation of GH and secondary candidal and bacterial infection.

## Lichen Simplex Chronicus (LSC)

- Treatment of LSC is aimed at interrupting the itch-scratch-itch cycle and the first-line measures to control itch include use of potent or very potent TCS and antihistamines.[17]
- It is important to ask the patient to use the TCS within the margin of the lichenified plaque and protect the surrounding skin with petrolatum to avoid perilesional hypopigmentation and atrophy (Fig. 1.11).

## Aphthous Stomatitis[18]

- ***Indications:*** Though the natural history of aphthous stomatitis is of spontaneous remission, many dermatologists do prescribe TCS to hasten healing and reduce the associated pain, which is often very severe.
- ***Use:*** Response to TCS in oral mucosa can be enhanced by cotton tip applications for 30 seconds and avoidance of eating or drinking for 30–60 minutes thereafter.
  - For mild disease, TCS such as fluocinonide, hydrocortisone, triamcinolone (as an oral paste) can be used to up to four times daily.
  - For severe aphthosis, potent TCS such as clobetasol (gel formulation) are used twice a day.

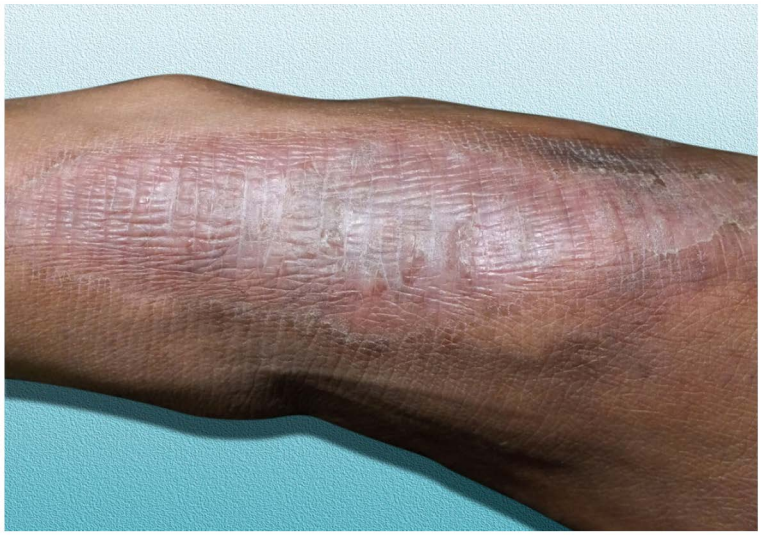

**Fig.1.11: Lichen simplex chronicus:** The first-line treatment to control itch include use of potent TCS and antihistamines. It is important to ask the patient to use the TCS within the margin of the lichenified plaque and protect the surrounding skin with petrolatum to avoid perilesional hypopigmentation and atrophy as seen in this patient.

  - Betamethasone/dexamethasone elixir 0.5 mg/5 ml three times daily can also be used as a swish and spit mouthwash.
  - Intralesional triamcinolone in concentration of 3–10 mg/ml repeated over 2–4 weeks intervals are useful in treatment of major aphthae.
  - TCS formulated in aerosol sprays can be used to target ulcers on the soft palate or oropharynx.
- ***Side effects:*** When used for less than 3 weeks, systemic absorption and HPA axis suppression are unlikely.

## Alopecia Areata (AA)

- ***Indications:*** Localized AA.
- ***Use:***
  - TCS, particularly the potent ones when used for at least 3 months, have shown efficacy in alopecia areata (few lesions) in some studies, although the results are variable and they do not appear to be effective in alopecia totalis/universalis.[19]
  - Intralesional corticosteroids: May be used in resistant patches.
- ***Advantages*:** Practical to use in the form of lotion and foam.
- ***Side effects:*** Transient folliculitis is the main side effect (Fig.1.12).

## Bullous Pemphigoid (BP)

- ***Indications:***
  - *Localized disease:* Potent and very potent TCS have emerged as first line therapy for limited disease.

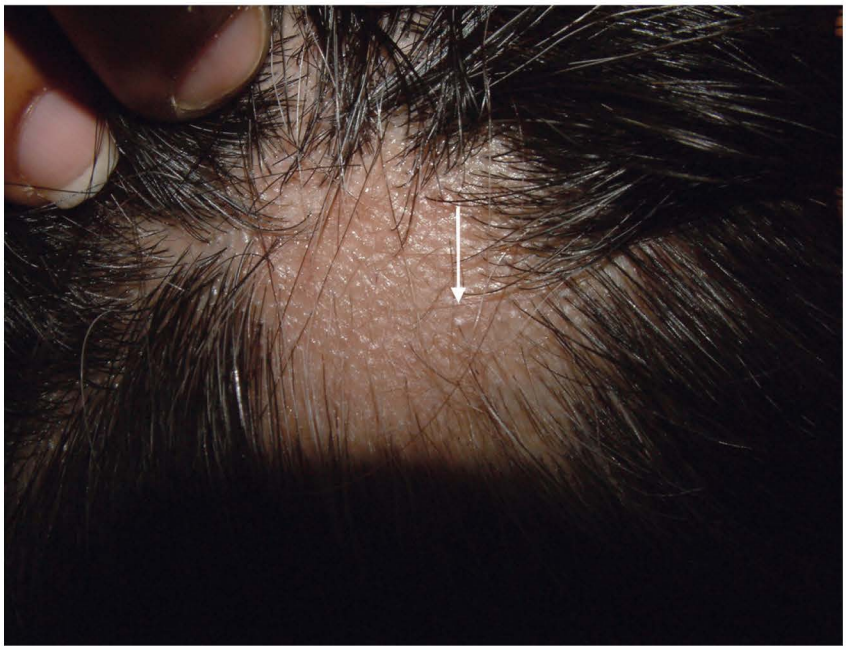

**Fig. 1.12: Alopecia areata.** Potent TCS as a lotion or foam are routinely used in the treatment of alopecia areata, when few lesions are present. Transient folliculitis (arrow) is the main side effect.

- *Moderate or extensive disease:* TCS are invariably used as an adjunct to systemic therapy in BP (Table 1.9) and may be used as a standalone therapy in patients who cannot use oral steroids and other immunosuppressives.

- ***Use:*** Very potent TCS (clobetasol propionate cream, 0.05%) applied twice a day (up to 40 g/day) to the whole body in extensive disease and to lesions in limited disease may be used as standalone therapy for 3 weeks. Even lower dose (10–30 g/day) is effective and is associated with fewer side effects.
- ***Disadvantages:*** However, the use of TCS in extensive disease may be limited by practical factors (time consuming, compliance and cost).

**Table 1.9: Summary of a clinical trials on use of TCS in bullous pemphigoid[6]**

| *Authors, year of publication* | *Drugs* | *Result* |
|---|---|---|
| Joly *et al*, 2002 | CP 0.05% cream BD *vs* Prednisone (0.5 mg/kg for moderate disease and 1 mg/kg for severe disease) | At 3 wks, CP cream was superior to oral prednisone in extensive bullous pemphigoid ($P = 0.02$), while both groups showed 100% disease control in moderate disease. |
| Joly *et al*, 2009 | CP was given depending on disease severity and body weight as mild regimen (10–30 g/day) *vs* Standard regimen (40 g/day) | Though disease control was excellent in both groups, there was 2-fold decrease in risk of death or life-threatening adverse events with mild regimen *vs* Standard regimen ($P = 0.039$). |

### Allergic Contact Dermatitis (ACD)

- ***Indications:*** Though avoidance of the allergen is the mainstay of therapy in acute ACD, TCS are required in most patients for rapid alleviation of symptoms, along with other measures (barrier creams, emollients and antihistamines). In extensive chronic ACD (like airborne contact dermatitis), TCS are frequently used as adjunct to systemic therapy.
- ***Use:*** Potency of TCS used depends on site and morphology of lesions (less potent steroids for face, flexures and more potent steroids for chronic lichenified lesions) and duration of use depends on response (longer for lichenified lesions). For extensive disease (like in airborne contact dermatitis), patient may need a short course of oral steroids and maintenance with oral immunosuppressive agents.

### Cutaneous T Cell Lymphoma

TCS have been used in the treatment of mild, patch stage MF with good results, but unfortunately, evidence in favor of using them is lacking. The current evidence-based recommendation is that the moderately potent or potent TCS are effective in temporarily clearing patches and plaques in some patients with early-stage IA/IB MF.[20]

### Discoid Lupus Erythematosus

- ***Indications*:** TCS are the cornerstone of initial therapy for patients with limited involvement and are an important adjunct to systemic therapy in extensive disease.
- ***Use:***
  - There is limited data comparing one molecule over another, but in general potent and very potent TCS appear to be more effective and DLE is one of the few conditions warranting use of potent steroids on the face. Occlusion may further help.[21]
  - Intralesional steroids give good response in patients with hypertrophic lesions.
- ***Side effects:*** Side effect of atrophy is probably not a concern in DLE which is a scarring dermatoses in itself.

### Pruritic Urticarial Papules and Plaques of Pregnancy (PUPPP)

- ***Indications:*** Since the patient is very symptomatic, most patients need to be treated with frequent application of potent TCS like betamethasone/mometasone and emollients, usually with antihistamines.[22]
- ***Response:*** New lesions usually stop appearing within a few days and subsequently the frequency of applications can be tapered (Fig. 1.13a and b).

### Pruritus Ani

- ***Indications:*** Cleansing and application of TCS are the mainstay therapy for chronic or idiopathic pruritus ani.

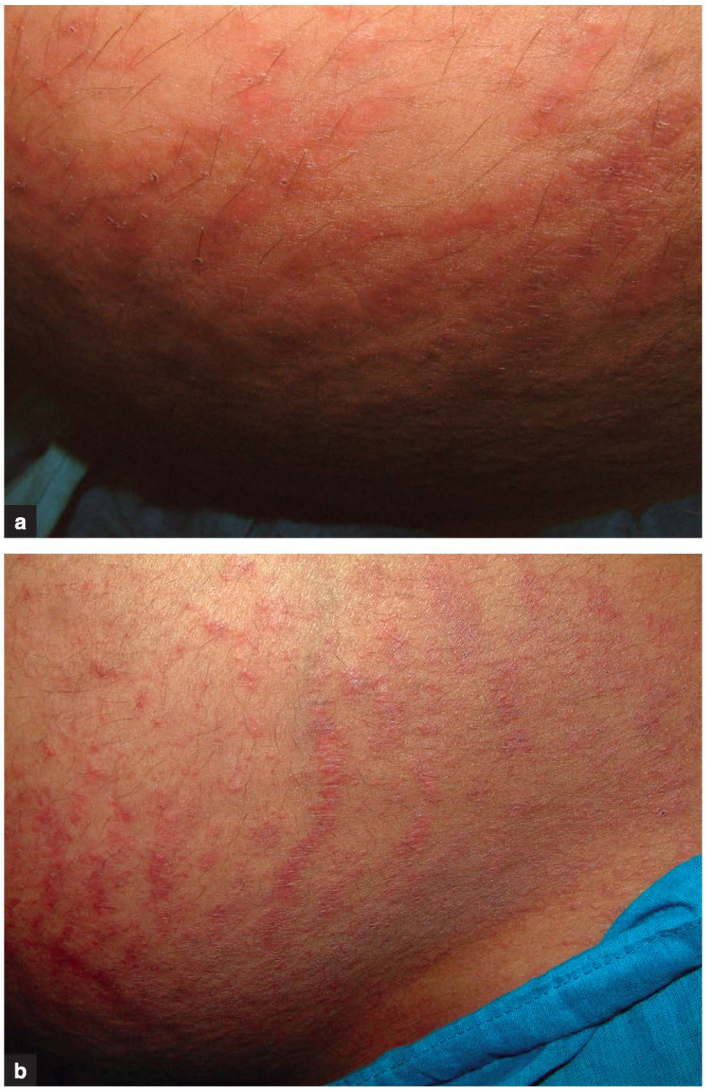


**Fig. 1.13: Pruritic urticarial papules and plaques of pregnancy. (a)** This extremely symptomatic patient in third trimester of pregnancy was treated with moderate potency TCS in cream base along with antihistamines and emollients. **(b)** Ten days later not only was she symptomatically better but lesions were conspicuously less erythematous and flatter.

- ***Use:*** A short course of mild to moderately potent TCS is recommended for a few weeks, followed by reduction in potency as symptoms improve.[23]
- ***Side effects:*** Caution must be taken with prolonged use of potent agents as the area is particularly prone to atrophy.

## Pruritus Vulvae

- ***Indication an basis of use:*** Identification and elimination of the suspected allergens and irritants is important in the treatment for pruritus vulvae. TCS

along with emollients are used to control the inflammation to provide symptomatic relief and interrupt the vicious itch-scratch cycle.

- ***Use:***
  - Moderately potent TCS ointment is preferred in pruritus vulvae as other formulations may contribute to allergic or irritant contact dermatitis.
  - Small quantity of ointment is used once a day (along with emollients several times a day) under close supervision to limit side effects such as striae, folliculitis, and atrophy.[24]

### Actinic Prurigo

- ***Indications:*** TCS are invariably used as adjunct to photoprotection in actinic prurigo.
- ***Use:***
  - *For acute disease*: Potent/very potent TCS along with photoprotection.
  - *Recurrent disease:* Springtime phototherapy is administered, often with application of moderate potency TCS to the affected areas prior to session of phototherapy to reduce the risk of flare.[25]

### Chronic Actinic Dermatitis (CAD)

- ***Indications:*** TCS are invariably used as adjunct to photoprotection in CAD.
- ***Use:*** Along with photoprotection, the treatment of active disease involves the use of potent TCS. For acute flares which are not sufficiently controlled with TCS, systemic steroids can be administered (tapered over weeks) and with continued use of TCS for maintenance of control often along with other immunosuppressives. [26]

### Irritant Chronic Dermatitis (ICD) of Hands

- ***Indications:*** Though avoidance of irritants, liberal use of moisturisers and appropriate hand care is the primary strategy in management of ICD, TCS are often used to control inflammation and relieve symptoms.
- ***Use:*** Potency of TCS used in ICD depends on the severity of irritant dermatitis, but usually mild-moderate potency TCS used once or twice a day is usually sufficient.
- ***Disadvantages:*** TCS induced secondary compromise in barrier function of skin must be considered. Topical calcineurin inhibitors may be used as alternative to low potency TCS in selective patients with mild inflammatory changes who do not experience a burning sensation when the product is applied.[27]

### Geographical Tongue

- ***Indications:*** For patients who continue to remain symptomatic despite consevative measures (gentle brushing and saline rinses, avoidance of hot, spicy food and harsh mouthwashes), TCS may be prescribed.
- ***Use:*** TCS are to be applied on tongue at bedtime and after meals till patient is symptomatically better.[28]

### Hailey-Hailey Disease

- ***Indications:*** Apart from controlling friction and infection, TCS along with anti-infective agents may be needed.
- ***Use:*** Combining anti-infective therapy with potent TCS is effective in controlling the disease flare when used promptly.
- ***Disadvantages:*** However, caution must be exercised as lesions are predominantly seen in flexures (axillae and groin) which are particularly susceptible to side effects of TCS.[29]

### Juvenile Plantar Dermatosis

- ***Indications:*** Changing to non-occlusive, open, leather footwear and cotton socks is the primary treatment strategy. TCS may be beneficial, if there is an inflammatory component.
- ***Use:*** A moderate or potent TCS applied once a day is usually sufficient, if patient is complying with other measures.[30]

### Lichen Planus (LP)

Although TCS are widely accepted and are practically almost always used as first line treatment in LP, there is paucity of scientific evidence supporting this conventional therapeutic modality.

- ***Indications:***
  - *Oral LP:* There are several RCTs (Table 1.10) and one Cochrane review[31] indicating the efficacy of TCS in oral LP but they should only be used if the patient is symptomatic.[32]
  - *Cutaneous LP:* There are only few RCTs assessing the usefulness of TCS. However, the majority of these trials are small, have used unvalidated outcome measures with high risk of bias. Unfortunately for genital LP, nail LP, lichen planopilaris and other lichenoid disorders there are no RCTs which have assessed the efficacy of TCS.
- ***Use*:**
  - *Cutaneous LP*: A potent TCS once daily application is used until remission, while in hypertrophic LP very potent TCS under occlusion is used initially and potency is titrated as patient responds.
  - For oral LP, potent TCS may be applied three times daily with a gloved finger. Efficacy of TCS in oral lesions can be enhanced by using an oral paste (steroids formulated in orabase) or gel formulation, using cotton tip application for 30 seconds and avoiding eating or drinking for 30–60 minutes thereafter. Also, mouthwash swish and rinse can be done with 5 mg prednisolone/2 mg betamethasone dissolved in 15 ml water three times a day. Oral candidiasis is a frequent complication of TCS treatment of oral LP and so these treatments are frequently combined with prophylactic weekly fluconazole, 150 mg.

**Table 1.10: Summary of a clinical trials on use of TCS in oral lichen planus[6]**

| *Authors, year of publication* | *Drugs* | *Result* |
|---|---|---|
| Campisi *et al*, 2004 | CP 0.025% microsphere *vs* CP 0.025% as lipophilic ointment in hydrophilic phase | New drug delivery system increased symptom remission and compliance |
| Conrotto *et al*, 2006 | CP 0.025% BD *vs* Topical ciclosporin 1.5% both in hydroxyethyl cellulose BD | CP more effective in inducing clinical improvement but associated with more side effects |
| Yoke *et al*, 2006 | Triamcinolone acetonide 0.1% in orabase TDS *vs* Topical ciclosporin 0.1% solution TDS | Triamcinolone group showed better clinical response and symptom relief than ciclosporin at week 4. |
| Laeijen decker *et al*, 2006 | Triamcinolone acetonide 0.1% in hydroxyethyl cellulose *vs* Tacrolimus 0.1% ointment both applied 4 times daily | Topical tacrolimus 0.1% ointment induced a better initial therapeutic response at 6 weeks, but was associated with frequent relapses at 3–9 weeks |
| Gorouhi *et al*, 2007 | Triamcinolone acetonide 0.1% paste QID *vs* Pimecrolimus 1% QID | Both groups showed significant clinical response at 4 months (P-0.86), with no prominent adverse effects |
| Carbone *et al*, 2009 | Topical clobetasol 0.025% *vs* Topical clobetasol 0.05% both in hydroxyethyl cellulose BD | Both showed significant clinical improvement (87% and 73%, with clobetasol 0.025% and clobetasol 0.05%, respectively), without any statistically significant difference after 2 months of treatment |
| Ghabanchi *et al*, 2009 | Triamcinolone acetonide 0.1% paste TID *vs* Mucoadhesive prednisolone tablet (5 mg) BD | A fair to good response was seen in both groups at 2 weeks |

## Pemphigoid Gestationis

- ***Indications:*** Management depends on the severity of disease with the goal of treatment being to suppress blister formation and to relieve intense pruritus.
  - *Mild cases*: Potent TCS along with systemic antihistamines.
  - *Severe cases:* Systemic steroids along with TCS and systemic antihistamines.

## Pretibial Myxedema

- ***Indications:*** TCS are indicated in patients with significant dermopathy.
- ***Use:*** Potent TCS with or without occlusion are used for at least 2 months. Using compression bandage may offer additional benefit in resistant cases. If symptoms persist, intralesional steroids may be tried. Systemic steroids have been shown to improve lesions in several patients, but their use is limited by systemic side effects.

### Sarcoidosis

- ***Indications:*** Localized disease, usually in single/few plaques.
- ***Use:*** Although high level scientific evidence is lacking, very potent TCS have been used successfully in localized cutaneous disease.

### Sweet's Syndrome

- ***Indications:*** Addressing underlying associated condition (malignancy, inflammatory bowel disease, infection, medication, radiation and pregnancy) may lead to resolution of skin lesions. Standard treatment of idiopathic Sweet's syndrome is systemic steroids but for localized disease, potent TCS may be tried.
- ***Use:***
  - *Limited/mild disease:* Very potent TCS and intralesional corticosteroids may be useful as monotherapy.
  - *Extensive disease:* As adjuvant treatment.

### Mastocytosis

***Indications:*** Although the resolution of mastocytomas may occur with or without treatment, resolution is faster with TCS.

## CHOOSING APPROPRIATE TCS

### Potency of TCS

The choice of potency of TCS used depends on several factors but it is recommended that therapy should be initiated with lowest potency of TCS to sufficiently control the disease and once partial disease control is achieved, a lower potency TCS is introduced. The factors which determine the potency of steroid to be chosen depends on:

- ***Dermatoses to be treated:*** Dermatological conditions can be divided on the basis of their response to steroids (Table 1.11) into:
  - *Highly responsive*, which respond to mild to moderately potent steroids.
  - *Moderately responsive*, which respond to moderately potent to potent steroids.
  - *Least responsive*, which would need treatment with potent to very potent steroids.
- ***Type of lesions:*** Potency of TCS chosen also depends on type of lesions, e.g. in psoriasis, thicker lesions need to be treated with more potent TCS, as also lichenified (LSC) and verrucous lesions.
- ***Sites/type of lesion to be treated*:**
  - *Thick skin:* Lesions on palms and soles need to be treated with more potent steroids, in ointment base, sometimes under occlusion.
  - *Thin skin sites:* Eyelids and genitalia need to be treated with less potent steroids.
  - *Flexures:* Potent steroids are best avoided in flexures like axilla and groin as these are naturally moist occluded sites.

**Table 1.11: Potency of TCS generally employed in different dermatological indications**

| *Highly responsive dermatoses require mild to moderate potency TCS* | *Moderately steroid responsive dermatoses require moderately potent to potent TCS* | *Least responsive dermatoses require potent to very potent TCS* |
|---|---|---|
| Intertriginous psoriasis | Atopic dermatitis (chronic/ lichenified) | Palmoplantar psoriasis |
| Atopic dermatitis (acute flares) | Seborrheic dermatitis | Hand dermatitis |
| Allergic contact dermatitis | Lichen simplex chronicus | Hypertrophic lichen planus |
| Irritant contact dermatitis | Pompholyx | Keloids/hypertrophic scars |
| | Papular urticaria | Discoid lupus erythematosus |
| | Pruritus ani | Actinic prurigo |
| | Pruritus vulvae | Lichen sclerosus |
| | Juvenile plantar dermatosis | Lichen nitidus |
| | Chronic actinic dermatitis | Morphoea |
| | Vitiligo | Cutaneous sarcoidosis |
| | Lichen planus | Granuloma annulare |
| | Chronic plaque psoriasis | Prurigo nodularis |
| | Parapsoriasis | Pyoderma gangrenosum |
| | Cutaneous T-cell lymphoma | Urticaria pigmentosa |
| | Bullous pemphigoid | Geographic tongue |
| | Alopecia areata | Pruritic urticarial papules and plaques of pregnancy |
| | | Pretibial myxedema |
| | | Sweet's syndrome |
| | | Necrobiosis lipoidica |

  - *Face:* Potent steroids are best avoided on the face unless the disease warrants it (e.g. lesions of discoid lupus erythematosus on the face can be treated with a very potent steroid because without treatment the lesions will cause more scarring of the face) because of risk of developing topical steroid damaged face.
- ***Duration of therapy*:** When long term therapy is required, start with mild TCS.
- ***Area to be treated*:** When large area is to be treated, start with mild TCS.

## Choosing Appropriate Vehicle

Vehicles should be chosen considering, the type and site of lesion, the potency of TCS and also occasionally previous history of contact sensitisation (Table 1.12).

## Using Appropriate Amount

- Adequate amount must be applied to get the desired therapeutic effect.
- Simple practical guide to quantify the amount of TCS to be used is to ask the patient to use a pea-sized amount (if small area has to be covered; Fig. 1.14a) or the fingertip unit (FTU)[33] if larger area has to be covered. A FTU is quantity of formulation extruded from a tube with a nozzle of 5 mm diameter extending from the distal crease of the forefinger to ventral aspect of the fingertip (Fig. 1.14b).

**Table 1.12: Properties of various vehicles used in formulations of TCS**

| *Vehicle* | *Hydration* | *Indications* | *Sites* | *Cosmesis* | *Irritation/CD* |
|---|---|---|---|---|---|
| **Ointment** | Very good | • Palmoplantar lesions<br>• Lichenified/ thick scaly dermatoses | • Palms and soles<br>• Avoid in naturally occluded areas | Greasy | Generally low |
| **Cream** | Moderate | Acute/subacute weeping lesions | Moist skin, intertriginous areas | Elegant | Variable, as contain preservatives |
| **Gel** | Drying | Dermatoses in dense hairy areas like scalp. Also mucosal lesions | Naturally occluded areas, scalp, mucosa | Elegant | Higher |
| **Lotion (oil in water)** | Drying | Scalp or dermatoses in dense hairy areas | Naturally occluded areas, scalp | Elegant | Higher |
| **Solution (alcohol)** | Drying | Scalp or dermatoses in dense hairy areas | Naturally occluded areas, scalp | Elegant | Higher |

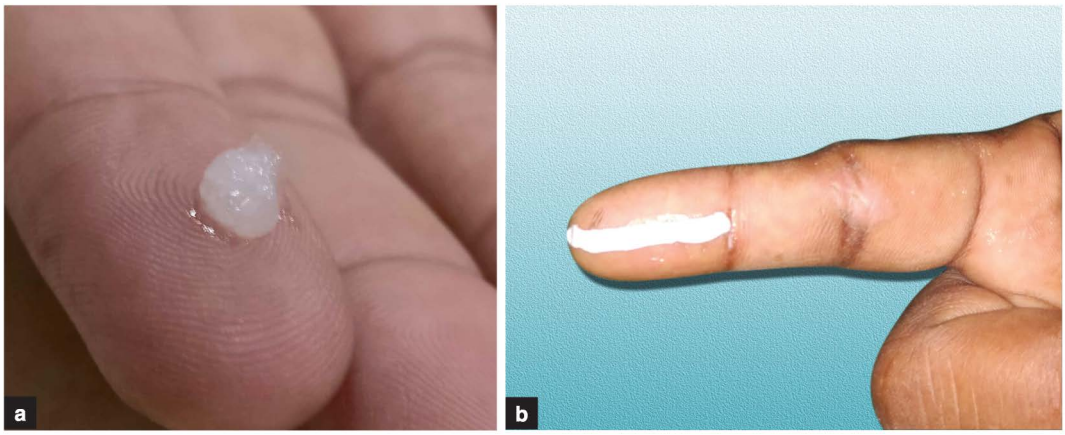


**Fig. 1.14. (a) Pea-sized amount. (b) Fingertip unit:** Quantity of formulation extruded from a tube with a nozzle of 5 mm diameter extending from the distal crease of index finger to ventral aspect of the fingertip. This unit weighs approximately 0.5 g and covers an area of 300 $cm^2$.

This unit weighs approximately 0.5 g and covers, on an average, an area of approximately 300 $cm^2$.

- The requirement to cover different parts of body are shown in Table 1.13 and Fig. 1.15.
- But as a thumb rule no more than 50 g/week of potent and 100 g/week of mild or moderate potent TCS should be applied in an adult.

## Frequency and Duration of Treatment

- Once daily application is as efficacious as more than one application of very potent steroid.

**Table 1.13: Number of FTUs needed for different body parts**

| *Anatomical area* | *Number of FTU/s required* |
|---|---|
| Face and neck | 2 |
| Anterior or posterior trunk | 7+7 |
| Arm | 3 |
| Hands (both sides) | 1 |
| Leg | 6 |
| Foot | 2 |
| Entire body | 40 |

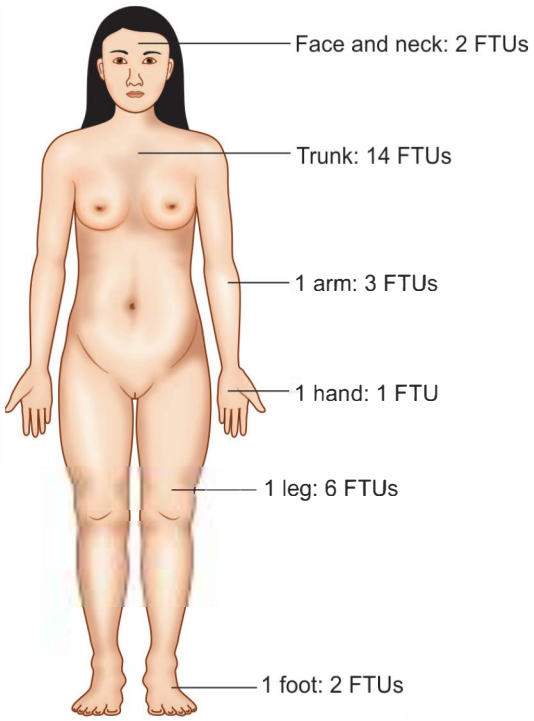


**Fig. 1.15:** Number of FTUs needed for different body parts.

- High potency formulations should be used for short periods (2–3 weeks) or intermittently and it is prudent to reduce frequency of application to alternate days or week end use) once disease control is partially achieved.
- Sudden discontinuation should be avoided after prolonged use to prevent rebound phenomenon.

## Mode of Application

- ***As is application*:** Patients are most frequently asked to apply appropriate quantity (using pea-sized amount or FTU) after hydration of the skin (after bath or soaks; Fig. 1.16a). When very potent/potent TCS are used, it is advisable

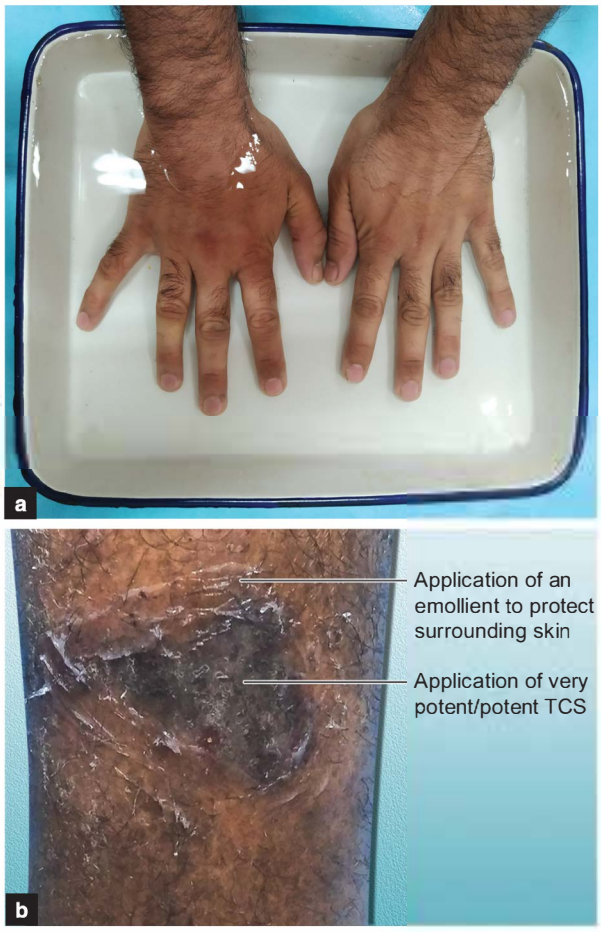


**Fig. 1.16: Optimising results with TCS. (a) Hydration of skin:** Patients are most frequently asked to apply appropriate quantity (using FTU) after hydration of the skin (bath or soaks). **(b) Protecting surrounding skin.** When very potent/ potent TCS are used, it is advisable to protect the surrounding uninvolved skin with an emollient to avoid side effects.

to protect the surrounding uninvolved skin with an emollient (Fig. 1.16b) to avoid side effects.

- ***Under occlusion*:** In thick (hyperkeratotic/lichenified) lesions, patient can be asked to use the TCS under occlusion. There are several ways of occluding the lesions:
  - *Bandaging* (Fig. 1.17a)
  - *Gloves and socks* (Fig. 1.17b)
  - *Cling film* (Fig. 1.17c)
- ***Wet wraps*:** In extensive AD, wet wrap therapy can be particularly helpful to rehydrate and soothen the skin and help TCS work better. Wet wraps are left on skin for several hours or overnight, taking care not to let them dry out. The steps for wet wraps include (Fig. 1.18):

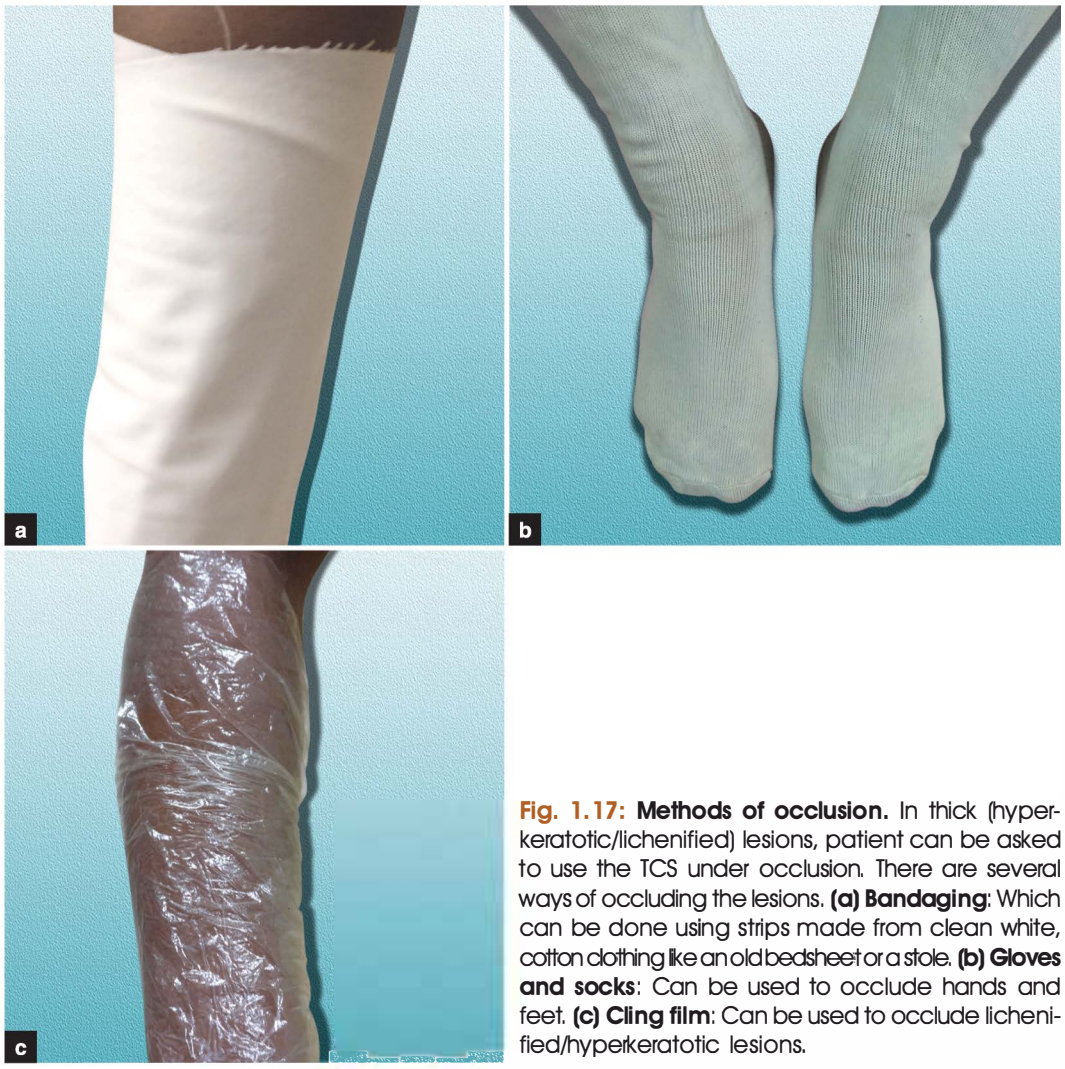


**Fig. 1.17: Methods of occlusion.** In thick (hyperkeratotic/lichenified) lesions, patient can be asked to use the TCS under occlusion. There are several ways of occluding the lesions. **(a) Bandaging**: Which can be done using strips made from clean white, cotton clothing like an old bedsheet or a stole. **(b) Gloves and socks**: Can be used to occlude hands and feet. **(c) Cling film**: Can be used to occlude lichenified/hyperkeratotic lesions.

- *Step 1*: Bathing/soaking, moisturizing and applying appropriate TCS on the affected area.
- *Step 2*: For the wet layer clean white cotton clothing or gauze from a roll is used. This is first moistened in warm water until slightly damp.
- *Step 3*: This wet dressing is wrapped around the affected area.
- *Step 4*: Then a dry layer is wrapped over the wet one.
- *Step 5*: Lastly, the patient is asked to carefully put on night-time clothing (pajamas or sweat suit) without disturbing the dressing.
- If the eczema is on the feet and hands, cotton gloves or socks are used as the wet layer with vinyl gloves or food-grade plastic wrap as the dry layer.

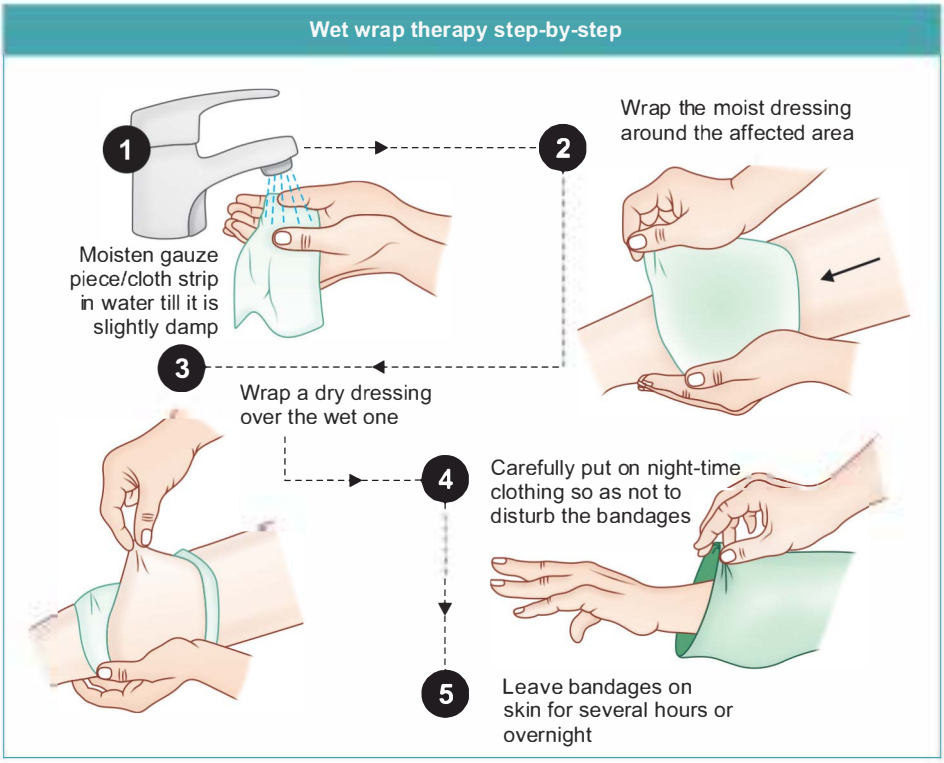


**Fig. 1.18:** Step-by-step of wet wrap therapy.

## REFERENCES


1. Mehta AB, Nadkarni NJ, Patil SP, Godse KV, Gautam M, Agarwal S. Topical corticosteroids in dermatology. Indian J Dermatol Venereol Leprol 2016; 82:371–8.
2. Luís Uva, Diana Miguel, Catarina Pinheiro, Joana Antunes, Diogo Cruz, João Ferreira, Paulo Filipe. Mechanisms of action of topical corticosteroids. Int J Endocrinol. 2012; 561018.
3. Abidi A, Ahmad F, Singh SK, Kumar A. Comparison of reservoir effect of topical corticosteroids in an experimental animal model by histamine-induced wheal suppression test. Indian J Pharmacol 2012; 44:722–5.
4. Ashworth J. Potency classification of topical corticosteroids: Modern perspectives. Acta Derm Venereol Suppl 1989;151:20–5.
5. Berth-Jones J. Principles of topical therapy. In: Griffiths CEM, Barker J, Bleiker T, Chabmers R, Creamer D, editors. Rook's Textbook of Dermatology, 9 th ed. WILEY Blackwell; 2016. p. 18.15.
6. Das A, Panda S. Use of topical corticosteroids in dermatology: An evidence-based approach. Indian J Dermatol 2017;62:237–50.
7. Hanifin J, Gupta AK, Rajagopal R. Intermittent dosing of fluticasone propionate cream for reducing the risk of relapse in atopic dermatitis patients. Brit J Dermatol 2002; 147: 528–37.
8. Wolkerstorfer A, Visser RL, De Waard van der Spek FB, Mulder PG, Oranje AP. Efficacy and safety of wet-wrap dressings in children with severe atopic dermatitis: influence of corticosteroid dilution. Br J Dermatol 2000; 143: 999–1004.
9. Green C, Colquitt JL, Kirby J, Davidson P. Topical corticosteroids for atopic eczema: clinical and cost effectiveness of once-daily vs more frequent use. Br J Dermatol 2005; 152:130–41.
10. Callen J, Chamlin S, Eichenfield LF, Ellis C, Girardi M, Goldfarb M, et al. A systematic review of the safety of topical therapies for atopic dermatitis. Br J Dermatol 2007; 156: 203–21.

11. Schlager JG1, Rosumeck S1, Werner RN1, Jacobs A2, Schmitt J3, Schlager C1, Nast A1. Topical treatments for scalp psoriasis: summary of a Cochrane Systematic Review. Br J Dermatol. 2017 Mar;176(3):604–14.
12. Manriquez JJ, Niklitschek SM. Vitiligo. In: Williams HC, Bigby M, Herxheimer A, Naldi L, Rzany B, Dellavalle R. et al., editors. Evidence-Based Dermatology. 3rd ed. Wiley-Blackwell Publishers. 2014. pp.44–9.
13. Bleehen SS. The treatment of vitiligo with topical corticosteroids. Light and electronmicroscopic studies. Br J Dermatol. 1976;94 suppl 12:43–50.
14. Papp KA, Papp A, Dahmer B, Clark CS. Single-blind, randomized controlled trial evaluating the treatment of facial seborrheic dermatitis with hydrocortisone 1% ointment compared with tacrolimus 0.1% ointment in adults. J Am Acad Dermatol 2012;67:e11–5.
15. Chi CC, Kitschig G, Baldo M, Brackenbury F, Lewis F, Wojnarowska F. Topical interventions of genital lichen sclerosus. Cochrane Database Syst Rev 2011; 7: CD008240
16. Neill SM, Lewis FM, Tatnall FM, Cox NH. British Association of Dermatologists' guidelines for the management of lichen sclerosus. Br J Dermatol 2010;163:672–82.
17. Datz J. A double-blind, multicenter trial of 0.05% halobetasol propionate ointment and 0.05% clobetasol 17-propionate ointment in the treatment of patients with chronic, localized atopic dermatitis or lichen simplex chronicus. Am Acad Dermatol 1991; 25: 1157–60.
18. Edgar NR, Saleh D, Miller RA. Recurrent aphthous stomatitis: A review. J Clin Aesthet Dermatol. 2017;10: 26–36.
19. Lenane P, Macarthur C, Parkin PC, Krafchik B, DeGroot J, Khambalia A, et al. Clobetasol propionate, 0.05%, vs. hydrocortisone, 1%, for alopecia areata in children. JAMA Dermatol 2014; 150: 47–50.
20. Trautinger F, Knobler R, Willemze R, Peris K, Stadler R, Laroche L, et al. EORTC consensus recommendations for the treatment of mycosis fungoides/Sézary syndrome. Eur J Cancer 2006;42:1014–30.
21. Hejazi EZ, Werth VP.Cutaneous lupus erythematosus: an update on pathogenesis, diagnosis and treatment. Am J Clin Dermatol 2016; 17: 135–46.
22. Yancey KB, Hall RP, Lawley TJ. Pruritic urticarial papules and plaques of pregnancy. Clinical experience in 25 patients. J Am Acad Dermatol 1984; 10: 473–80.
23. Al-Ghnaniem R, Short K, Pullen A, Fuller LC, Rennie JA, Leather AJ. 1% hydrocortisone ointment is an effective treatment of pruritus ani: a pilot randomized control crossover trial. Int J Colorectal Dis 2007; 22: 1463–7.
24. Weichert GE. An approach to the treatment of anogenital pruritus. Dermatol Ther 2004; 17: 129–33.
25. Lane PR, Moreland AA, Hogan DJ. Treatment of actinic prurigo with intermittent short-course topical 0.05% clobetasol 17-propionate: a preliminary report. Arch Dermatol 1990; 126: 1211–3.
26. Paek SY, Lim HW. Chronic actinic dermatitis. Dermatol Clin 2014; 32: 355–61.
27. Warshaw EM. Therapeutic options for chronic hand dermatitis. Dermatol Ther 2004; 17: 240–50.
28. Menni S, Boccardi D, Crosti C. Painful geographic tongue (benign migratory glossitis) in a child. J Eur Acad Dermatol Venereol 2004;18: 737–8.
29. Burge SM. Hailey-Hailey disease: the clinical features, response to treatment and prognosis. Br J Dermatol 1992; 126: 275–82.
30. Gibbs NF. Juvenile plantar dermatosis. Can sweat cause foot rash and peeling? Postgrad Med 2004; 115: 73–5.
31. Cheng S, Kirtschig G, Cooper S, Thornhill M, Leonardi-Bee J, Murphy R. Interventions for erosive lichen planus affecting mucosal sites. Cochrane Database Syst Rev 2012;2:CD008092.
32. Lodi G, Carrozzo M, Furness S, Thongprasom K. Interventions for treating oral lichen planus: A systematic review. Br J Dermatol 2012;166:938–47.
33. Long CC, Finlay AY. The fingertip unit—a new practical measure. Clin Exp Dermatol 1991; 16:444–7.

## ANNEXURE 1: SOME COMMON AVAILABLE BRANDS OF TOPICAL CORTICOSTEROIDS

| *Generic salt* | *Brands* | *Preparation* | *Potency* | *Cost (₹)/g or /ml* |
|---|---|---|---|---|
| | | **High Potent TCS** | | |
| Clobetasol 0.05% | Cosvate | Cream | 15 g, 30 g | 4.6, 3.4 |
| | | Ointment | | |
| | | Lotion | | |
| | Excel | Cream | 15 g | 7.6 |
| | | Ointment | | |
| | | Lotion | 15 ml | 11.4 |
| | Lobate | Cream | 15 g, 30 g | 2.5, 2.8 |
| | | Ointment | | |
| | | Lotion | 89 (25 ml) | 4.21 |
| | Tenovate | Cream | 30 g | 3.2 |
| | | Ointment | 15 g | 4.5 |
| | | Lotion | | |
| | Topinate | Cream | 30 g | 2.1 |
| | | Ointment | 15 g | 3.9 |
| | | Lotion | 15 ml | 9.56 |
| | Clop | Cream | 30 g | 3.8 |
| | | Ointment | 30 g | 1.4 |
| | | Lotion | 15 ml | 3.6 |
| Betamethasone dipropionate 0.05% | Diprobate | Cream | 16 g | 3.8 |
| | | Ointment | 15 g | 59.0 |
| | | Lotion | 16 g | 2.0 |
| Halobetasol propionate 0.05% | Halovate | Cream | 15 g | 13.0 |
| | | Ointment | 30 g | 7.8 |
| | | Lotion | 30 ml | 7.4 |
| | Halobet | Cream | 15 g | 7.6 |
| | | Ointment | 30 g | 7.8 |
| | | Lotion | 30 ml | 7.4 |
| | Halotop | Cream | 30 g | 6.8 |
| | | Ointment | 30 g | 6.8 |
| | | Lotion | 50 ml | 1.74 |
| | Halox | Cream | 15 g, 30 g | 10.6, 4.7 |
| | | Ointment | 20 g | 09.2 |
| | | Lotion | 30 ml | 06.6 |
| | | **Potent TCS** | | |
| Betamethasone 0.05% | Diprobate | Lotion | 30 ml, 50 ml | 1.3, 2.5 |
| Fluocinolone acetonide 0.1% | Flucort H | Cream | 20 g | 4.38 |
| | | Ointment | Unavailable | |
| | | Lotion | 30 ml | 3.9 |
| Mometasone furoate 0.1% | Momate | Cream | 5 g | 10.8 |
| | | Ointment | 15 g | 15.3 |
| | | Lotion | 30 ml | 10.9 |
| | Cutizone | Cream | 15 g | 10 |
| | | Ointment | 15 g | 16 |
| | | Lotion | 15 ml | 7 |
| | Momoz | Cream | 30 g | 7.4 |
| | | Ointment | 15 g | 9.8 |
| | | Lotion | | |

(*Contd.*)

(*Contd.*)

| *Generic salt* | *Brands* | *Preparation* | *Potency* | *Cost (₹)/g or /ml* |
|---|---|---|---|---|
| | Momtas | Cream | 20 g | 8.75 |
| | | Ointment | 1 g | 15.48 |
| | | Lotion | | |
| | Elocon | Cream | 5 g | 18.2 |
| | | Ointment | 10 g | 21.0 |
| | | Lotion | 5 ml | 18.2 |
| Fluticasone | Flutivate | Cream | 10 g | 13.3 |
| proprionate 0.005% | | Ointment | 20 g | 6.55 |
| | | Lotion | | |
| | Flutopic | Cream | | |
| | | Ointment | 10 g | 4.8 |
| | | Lotion | | |
| | | **Moderate TCS** | | |
| Desonide 0.05% | Desowen | Cream | 10 g | 16.8 |
| | | Ointment | | |
| | | Lotion | 30 ml | 06.1 |
| | Dosetil | Cream | 10 g | 09.3 |
| | | Ointment | | |
| | | Lotion | 30 ml | 04.2 |
| Clobetasone 0.05% | Eumosone | Cream | 15 g | 04.6 |
| | | Ointment | | |
| | | Lotion | | |
| Fluocinolone 0.01% | Flucort | Cream | 20 g | 0.45 |
| | | Ointment | 15 g | 2.13 |
| | | Lotion | 15 ml | 02.7 |
| | Sebowash | Shampoo | 100 ml | 02.11 |
| Fluocinolone 0.025% | Flucort | Cream | 20 g | 04.45 |
| | | Ointment | | |
| | | Lotion | 15 ml | 06.4 |
| | Flucort forte | Cream | | |
| | | Ointment | | |
| | | Lotion | 15 ml | 06.4 |
| Betamethasone | Betnovate | Cream | 20 g | 01 |
| valerate 0.1% | | Ointment | | |
| | | Lotion | 20 ml | 0.7 |
| | | **Mild TCS** | | |
| Hydrocortisone | Cutisoft | Cream | 10 g | 09.00 |
| acetate 1% | | Ointment | | |
| | | Lotion | 50 ml | 4.5 |
| | Drocort | Cream | 15 g | 3.2 |
| | | Ointment | 15 g | 3.3 |
| | | Lotion | | |
| Hydrocortisone | Efficort | Cream | 10 g | 19.3 |
| aceponate, 0.127% | | Ointment | | |
| | | Lotion | | |
| Triamcinolone | Kenacort | Oral paste | 5 g | 13.6 |
| acetonide | Cinort | Oral paste | 5 g | 11.6 |

**Note:** This list is not exhaustive. The price is not a reflection on the quality of brands.