An overview of steroid use and its potential side-effects

Steroids are fatty or lipid compounds formed by the body from cholesterol which is produced in the liver and used by the adrenal glands in the synthesis of these hormones. In everyday practice patients are prescribed steroids to treat a range of conditions from asthma through arthritis, eczema, multiple sclerosis, leukaemia and many other diseases (plus of course COP/BOOP). Pharmacologically they are used in much larger doses: their action is twofold, to suppress inflammation and the immune response. Steroids lower white cell counts and antibody formation, immunosuppression with prednisolone occurs at doses in excess of 20 mg per day. The immune response is suppressed to prevent organ transplant rejection or to treat severe systemic allergic reactions. Health professionals are likely to watch out for the side-effects of the immune and inflammatory suppression.

below: chemical structure of prednisone (left) and prednisolone (right) which are very similar compounds

Steroids are classified as either short-to-medium acting, intermediate or long acting. Short acting steroids include hydrocortisone, cortisone, prednisone (an inactive form converted to prednisolone in the liver) and prednisolone.

Effects on Adrenal Cortex
The administration of steroids for a period exceeding two weeks runs the risk of suppression of the adrenal cortex. Patients on steroids for less than one week may have them stopped without the risk of adrenal suppression. In people who take large doses of corticosteroids, such as prednisone or prednisolone the function of the adrenal glands will become suppressed. This suppression occurs because these large doses prevent the hypothalamus and pituitary glands from producing the hormones that normally stimulate adrenal function. If the person abruptly stops taking corticosteroids, the body cannot restore adrenal function quickly enough, and temporary adrenal insufficiency (a condition similar to Addison’s disease) results. Also when stress occurs, the body is not able to stimulate the additional production of corticosteroids that are needed. Therefore doctors never discontinue the use of corticosteroids abruptly if they have been taken for more than 2 or 3 weeks. Instead,
they taper the dose over months or even for more than a year. The dose may need to be increased in people who become ill or otherwise severely stressed while taking corticosteroids. Corticosteroid use may need to be resumed in a person who becomes ill or otherwise severely stressed within weeks of having the corticosteroid tapered and discontinued.

Steroids in pharmacological doses over a prolonged period of time can cause Cushing's syndrome with associated oedema and redistribution of fat. Fluid retention leads to a swelling of the face called 'mooning' as the face becomes rounded like a full moon. A central type of obesity develops with thin extremities, a fatty 'buffalo hump' on the neck and enlargement of the supraclavicular area (above collar bone or clavicle). These features are related to excessive protein catabolism (where breakdown of stored protein is used as fuel in times of stress) as well as sodium and water retention. The retention of sodium and water also leads to hypertension and weight gain.

Health professionals are likely to advise patients to continue their medication as prescribed, never miss a dose even if they feel unwell and not to stop their medication abruptly. Monitoring of fluid intake and output, blood pressure, weight check and a low sodium diet are usually carried out. The patient is also advised to carry a steroid card or wear an ID bracelet and tell any nurse, dentist or doctor that they are taking steroids.

Risk of Infection
Due to the significant anti-inflammatory effect of steroids, infections may be marked and become severe before producing recognisable symptoms. When an infection develops in a patient taking steroids it tends to spread quickly as the immune system is suppressed and may not be diagnosed in the early stages. Health professionals are likely to be alert to the risk of infection as a result of immune suppression and anti-inflammatory response. Assessment will include monitoring of vital signs. A good standard of personal hygiene should be maintained by the patient. The oral status of the patient should be checked and they may be told about the importance of good oral hygiene and regular dental checks. They are likely to be advised to avoid exposure to all sources of infection and avoid people who have been vaccinated in the past three months, in particular with oral polio vaccine. Broad spectrum antibiotics may be prescribed prophylactically to prevent infections.

Gastrointestinal Disturbance
Steroids increase the risk of gastric disturbance and symptoms may range from a mild effect on taste to dyspepsia (heart burn). Peptic ulceration may develop as a consequence of long-term corticosteroid therapy. Patients who have a history of peptic ulcers are prone to a recurrence of the condition & also run the risk of bleeding and perforation. While peptic ulceration may have a fairly quick onset, it is reversible on discontinuation of therapy. Health professionals may also assess for blood loss by using blood checks as there is a tendency for bleeding or perforation; observation for melaenea (blood in faeces) or haematemesis (blood in vomit) is important. Vigilance by both the health professional and patient will assist in early detection of gastrointestinal disturbance and prevent any further exacerbation of gastric symptoms. Proton-pump inhibitors may be prescribed to reduce gastrointestinal disturbance and acid reflux problems eg Lansoprazole (Zoton), Omeprazole or Esomeprazole (Nexium).

Skin Changes and Wound Healing
Skin changes are common side-effects of steroids. Thinning of the skin, a tendency to bruise easily and extensively with slight trauma and the development of large
haematomas (bruises) are common. Purple striped marks on the skin of the thighs, buttocks, abdomen and arms may occur. Also oily skin, acne rashes on the cheeks and decreased muscle mass and weakness may occur. Steroids also interrupt or delay healing. They break down protein and suppress inflammation, and initial fibrous tissue is not laid down in the normal way. There is also likely to be hair thinning or loss but these effects are reversible once steroid treatment is complete.

Osteoporosis
Corticosteroids affect bone in three main ways: through catabolic effects resulting in loss of bone mass; anabolic effects in which steroids decrease the conversion of amino acids to protein resulting in loss of bone protein and osteoporotic lesions; and effects on calcium metabolism in which there is increased urinary excretion of calcium and phosphorus leading to bone loss. Patients should report any bone or back pain or discomfort. Attention to diet is also important and the patient should eat foods that are high in calcium and vitamin D and low in fat; a doctor's advice should be sought in relation to the use of calcium supplements. To prevent the risk of fractures in patients taking steroids, prevention of falls is important. Drugs such as the bisphosphonates (eg Alendronic acid) may be prescribed to prevent bone loss.

Mental Issues
Changes in mental state are likely to result from steroids. Mild mental changes are occasionally observed after a few days of treatment and may include excitation, euphoria, hypomania and insomnia. Patients initially on high steroid doses maybe become manic, excitable and incur personality changes. They may appear extremely cheerful, talkative, have boundless energy, make impulsive decisions and feel the need for significantly less rest or sleep; this can cause strain on relationships with carers and loved ones.

Diminished Resistance to Stress
For the patient taking steroids, the adrenal cortex is unable to meet the body's requirements during times of stress and it may be necessary to administer glucocorticoids to boost the patient's stress response. Supplementary therapy in minor stress may require a twofold increase in dosage for 24-48 hours; in severe cases such as trauma or major surgery a tenfold increase may be recommended for 48-72 hours. If patients taking steroids are not given increased dosage of corticosteroids to sustain them through their trauma or surgery they could die in hypotensive collapse (a severe drop in blood pressure) even after undergoing quite trivial surgical procedures or when given an anaesthetic. In cases of accidents or trauma, the health professional must always be alert and ascertain whether the patient is taking steroid medications.

Cataract and Glaucoma
There is a potential for ocular side-effects such as glaucoma and cataracts to occur in patients taking steroids. Occasional eye pressure checks are recommended for patients on chronic systemic steroids in whom elevated intraocular pressure may also occur. Steroid medications tend to stimulate the formation of cataracts by the development of distorted lens fibres on the front surface of the posterior lens capsule. The mechanism for this is unclear although it may be due to destabilisation of lens proteins from steroid molecules and to some extent the likelihood of this or severity of cataract formation is dependent on the cumulative steroid dose.

Anti-inflammatory Effects
Another side-effect of corticosteroid dosage is that pre-existing conditions such as arthritis, joint or muscle pain may be masked by the drug's anti-inflammatory effect during treatment and the patient may feel significantly better and pain-free. However
these painful conditions may reappear rapidly and suddenly after the tapering or cessation of steroid dosage.

**Useful Links:**

*Prednisone/Prednisolone medication and side-effects:*

*Steroid use in Rheumatoid Arthritis adverse effects with low doses:*
http://www.astrazeneca.no/lege/infopoems/0605_1.html

*The facts about Corticosteroids (Part 1):*
http://arthritis.about.com/cs/steroids/a/corticosteroids.htm

*Ditto (Part 2):*  http://arthritis.about.com/cs/steroids/a/corticosteroids_2.htm

*Quantification of hip fracture & cataracts associated with low dose long-term Prednisone use:*
http://www.findarticles.com/p/articles/mi_m0984/is_4_118/ai_71127823

*Common questions people ask about prednisone:*
http://www.myasthenia.org/information/Prednisone.htm

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