Alopecia can affect the scalp or other parts of the body and can be localized or widespread. It may be due to hair shedding, poor quality hair, or hair thinning and can be scarring or non-scarring in nature (Table 1).

Hair grows on most parts of the skin surface, except the palms, soles, lips, and eyelids. Hair thickness and length varies according to site. Vellus hair is fine, light in colour, and short in length. Terminal or androgenic hair is thicker, darker, and longer. A hair shaft grows within a follicle at a rate of about one cm per month, due to cell division at the base of the follicle (hair bulb). The cells produce the three layers of the hair shaft (medulla, cortex, cuticle), which are essentially made of the protein keratin. Hair growth follows a cycle. However, these phases are not synchronised and any hair may be at a particular phase at random.

The hair cycle can be divided into three main phases:
- **Anagen**: This is actively growing hair
- **Catagen**: Transition phase of two to three weeks when growth stops and the follicle shrinks
- **Telogen**: Resting phase for one to four months, up to 10 percent of hairs in a normal scalp.

Hair length depends on the duration of anagen. Short hairs (eyelashes, eyebrows, hair on arms and legs) have a short anagen phase of one month. Anagen can last up to six years or longer in scalp hair.

Hair loss can be due to physiologic, autoimmune, hormonal, or medical factors, or associated with hair shaft abnormalities.1-5 (Table 2)

Anagen shedding is known as anagen effluvium and has variable duration and sudden onset. Anagen effluvium is caused by autoimmune disease (e.g., severe diffuse alopecia areata), medications (e.g., cytotoxic/chemotherapy drugs), or congenital condition (e.g., loose anagen syndrome).

Over-shedding is known as telogen effluvium. It occurs two to six months after an inciting event that stops active hair growth. Telogen effluvium is commonly caused by stressors, including:

**TABLE 1. CAUSES OF ALOPECIA**

<table>
<thead>
<tr>
<th>Alopecia</th>
<th>Non-scarring</th>
<th>Diffuse</th>
<th>Aging</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Localized</td>
<td>Telogen effluvium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Drug induced</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Pattern</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Aretata</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mechanical</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Trauma</td>
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<td></td>
<td></td>
<td></td>
<td>Lichen planus</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Lupus erythematosus</td>
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<tr>
<td></td>
<td></td>
<td>Scarring</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hirsutism</td>
<td>Constitutional</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acquired</td>
<td>Androgenization</td>
<td>Drug induced</td>
</tr>
</tbody>
</table>

**TABLE 2.**

<table>
<thead>
<tr>
<th>Physiology</th>
<th>Anagen effluvium</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Telogen effluvium</td>
</tr>
<tr>
<td></td>
<td>Pregnancy</td>
</tr>
<tr>
<td>Autoimmune</td>
<td>Alopecia areata</td>
</tr>
<tr>
<td>Pattern-thinning of hair</td>
<td>Androgenic</td>
</tr>
<tr>
<td>Hair shaft abnormalities</td>
<td></td>
</tr>
<tr>
<td>Medical disease</td>
<td>Inflammatory skin disease</td>
</tr>
<tr>
<td></td>
<td>Illness, surgery, anaemia, thyroid</td>
</tr>
<tr>
<td></td>
<td>Trichotillomania</td>
</tr>
<tr>
<td></td>
<td>Cancer treatment</td>
</tr>
</tbody>
</table>

1. Fever, weight loss, pregnancy
2. Surgical operation, illness, or psychological stress
3. Medications, e.g., contraceptives, anticoagulants, anti-convulsants
4. Others (unknown)
Shedding can persist for years (chronic telogen effluvium), during which scalp hair continues to grow, but has a shorter natural length than normal.

Pattern hair loss is due to hormonal influence and increases with age. Male pattern alopecia affects vertex and temporal scalp. Female pattern alopecia affects the anterior scalp.

Hair shaft defects can be congenital or acquired due to disease or injury. Hair shaft abnormalities can be diagnosed by dermatoscopy or more intensive examination of the hair. They include, fractures, irregularities, coiling, and twisting.

Conditions resulting in reversible patchy hair thinning include:

- Localized alopecia areata
- Tinea capitis, psoriasis, seborrheic dermatitis, atopic dermatitis, pityriasis rubra pilaris, cutaneous lupus erythematosus, cutaneous T-cell lymphoma
- Generalized skin disease (erythroderma), severe illness, iron, thyroid deficiency

Scarring alopecia can be due to injury, infections or inflammatory skin diseases. It is secondary to damage of the hair follicle. Infections may be viral, bacterial, or fungal. Inflammatory skin diseases like lupus, scleroderma, and cellulitis can contribute to scarring alopecia.

**APPROACH TO HAIR LOSS**

Hair loss can be frustrating, reducing quality of life and causing emotional problems. Loss of normal scalp hair increases the risk of UV exposure and related injury. A careful history and full skin examination can help to identify the cause. Further tests may include hair pluck test with trichogram to determine relative proportion of anagen and telogen hairs, Wood’s lamp examination, swabs of pustules for culture, skin scrapings, hair clippings, and blood tests.

Prevention of hair loss is important. It is prudent to minimize injury to the hair shaft through lifestyle changes. For example, patients may be instructed to dry their hair with a towel or naturally, rather than with a heat dryer; reduce chemical treatments; and avoid tight hairstyles to reduce mechanical damage. The prognosis for hair loss depends on the cause. Scarring alopecia is irreversible. Anagen and telogen hair loss will cease with time. Early treatment of pattern alopecia can help slow down hair thinning. Finally, treatment of inflammatory disease is essential. Management can be divided into surgical and nonsurgical measures. Basically, infections and inflammation should be treated, dietary deficiencies fixed, and causative drugs identified and discontinued.

1. **Medicine:** Anti-androgens, steroids, minoxidil
2. **Medical devices**
3. **Lifestyle modifications**
4. **Surgical and Injectibles**

**Hair shaft defects can be congenital or acquired due to disease or injury.**

Hair shaft abnormalities can be diagnosed by dermatoscopy or more intensive examination of the hair.

**Medicine.** Medication can be divided into local and systemic. Finasteride is FDA approved for treating male hair loss. It mechanism of action includes stopping the production of dihydrotestosterone, hence encouraging hair regrowth. A topical medication for the scalp is 5% minoxidil. It can stop hair thinning and stimulate hair growth. Concurrent use of a topical retinoid can enhance efficacy. Corticosteroids can be used topically or injected into your scalp to stop the inflammation during conditions like alopecia areata.

Alternatives with weak evidence include tacrolimus 0.1%, dithranol, and bimatoprost. Bimatoprost has been used to increase eyelash hair, but scalp application is not approved or widely published.

Systemic drugs include immunosuppressants like steroids, cyclosporin, and methotrexate, but are not recommended.

Of special mention is a marine protein derivative, Viviscal, which has been FDA approved for hair loss. It is purported to enhance the hair cycle growth phase. Not much is known about the mechanism of action. That said, feedback from my patients has been positive.

**Medical Devices.** Light therapy is safe and used to treat androgenetic alopecia. It is postulated to enhance blood flow in the scalp. It has also been suggested to improve the wound healing process in post hair transplant patients and hasten hair growth. However, the evidence is weak.

A multicenter trial reported that male patients with androgenic alopecia exhibited a statistically significant increase in average hair density (p <0.0001). Similar results were shown in a study comprising women with androgenic alopecia.

In a second study of 103 males and 122 females with pattern alopecia that completed the study, HairMax® LaserComb (with 12, nine and seven beams) was reported to result in increase in terminal hair density versus trial subjects in the control group. Ongoing trials are investigating the efficacy of other light therapy devices in various types of alopecia.
**Lifestyle Changes.** Good scalp care to keep hair clean with stimulating massage, and the safe use of a hair dryer are important. Maintaining exercise and stress control, and eating healthy food rich in protein, vitamins, and minerals, like iron, also help. Patients should avoid birth control pills, anabolic steroids, alcohol, and smoking. Finally, camouflage with wigs and hair pieces are options.

**Surgery and Injectables.** Surgical treatment for hair loss will not be discussed in this paper, though these are supported by accumulated evidence. Platelet Rich Plasma (PRP) warrants close consideration. The use of platelet growth factors to stimulate hair growth and reduce hair loss has achieved quite effective results for both androgenic alopecia and alopecia areata, noted in small scale studies. We await large scale randomized controlled studies on the use of this modality. This area is promising, but it is clear that with the lack of intellectual property potential, pharmaceutical companies would hesitate to fund a large clinical trial.

**Botulinum Toxin.** The science behind use of neurotoxins for hair loss is the relaxation of scalp musculature, hence decompressing blood vessels in the scalp and increasing oxygen delivery. DHT is converted to estradiol in oxygen-rich medium. A 60-week study has reported increase in hair growth and reduction in hair loss in males with androgenic alopecia.

**HIRSUTISM**

Hirsutism refers to excessive hair growth in women in a male type pattern. Hirsutism can involve a single site or multiple sites. (Table 3)

A hirsute pattern of hair growth is usually pre-determined genetically. The degree varies across culture, ethnicity, and race. Late onset hirsutism may be due to hyperandrogenism. Hyperandrogenism is often associated with polycystic ovaries, insulin resistance, and obesity. Rare causes include, androgenic medications, congenital adrenal hyperplasia, tumour of adrenal gland or ovary, and Cushing’s syndrome.

Different genes expressed in individual hair follicles vary in their response to androgens. Hair follicles in the secondary hair growth sites are more sensitive to androgens than those in other areas. Severity of hirsutism may be assessed using the Ferriman-Gallwey visual scale or a modified version, which assesses nine areas of the body.

The score varies from 0 (no hair) to 4 (extensive hair growth) in each area:

- **Total score <8:** normal hair growth
- **Total score 8–14:** mild hirsutes
- **Total score ≥15:** moderate to severe hirsutes

General examination may point to the cause of hirsutism. Acanthosis nigricans suggests insulin resistance. Galactorrhoea suggests hyperprolactinaemia. Purple striae, thin skin, bruising, and facial plethora suggest Cushing syndrome. Virilisation suggests hyperandrogenism. Signs include deepening voice, balding, acne, decrease in breast size, increased muscle bulk.

Diagnostic features for polycystic ovary syndrome include signs of hyperandrogenism, oligo, or anovulation and the pressure of sizeable follicles in each ovary, increased ovarian volume on ultrasound.

Hirsutism is diagnosed clinically. Investigations are not usually necessary, unless a Ferriman-Gallwey score is >15. Blood tests are done to evaluate male hormone levels and underlying diseases. This can be followed by ovarian ultrasound scan.

Management of hirsutism can be divided into mechanical and medical methods, aimed at removing hair and/or modifying any underlying causes.

**Mechanical Treatment.** Depilatory creams commonly contain thioglycolate, and can irritate skin. Shaving is another...
er option. Waxing would need to be done every six weeks. All these carry a risk of folliculitis, which may take time to resolve.18-24

Electrolysis or thermolysis consists of a small probe inserted into the hair and a small electrical discharge destroys the hair. This carries a risk of scarring.

Lasers and intense pulsed light are the most effective devices for hair removal. The long pulse 1064nm ND Yag laser is ideal for darker skin patients Fitzpatrick 4 to 6, while the 755nm alexandrite and IPL can be used for lighter skin types. Multiple treatments are required, spaced six weeks apart.21-24

Medical Treatment of Hirsutism. Medical treatment options for hirsutism18-20 include metformin or rosiglitazone, which can be prescribed to women with polycystic ovarian syndrome. Hormonal treatment with antiandrogen medicines may be useful for women with hirsutism. Effects may take six to 12 months, and the medicine needs to be continued for years.

Spironolactone can reduce excessive hair growth. A synergistic effect is achieved when combined with a contraceptive pill. Combined birth control pills that contain estrogen and progesterone:cyproterone are effective. Side effects include mood swings, loss of libido, and weight gain.

LOOKING FORWARD

In the realm of hair loss, low level light therapy is a fascinating area deserving of further research.

With the interest in non-invasive treatments growing, personally I believe combination therapy with minoxidil, antiandrogens and low level light therapy would be the gold standard treatment for hair loss in the future.

As for hirsutism, it is not yet possible to prevent a genetically predetermined cause. Insulin resistance associated with obesity can be reduced by diet and lifestyle changes. Prognosis is dependent on the cause. The most common types of excessive hair growth is permanent. Hirsutism has a tendency to worsen with age.

Dr. Daniel Chang specializes in Aesthetic and Regenerative Medicine and is a Key Opinion Leader and Regional Trainer. Dr. Chang founded Asia Aesthetic Academy in 2015 and has developed a number of signature treatments, including the DC 3D-Dreamlift and the DC 3D-Noselfit. He maintains a Korean Aesthetics site and can be reached at drdanielchang.com

1. Diagnosis and Treating Hair Loss – Am Fam Physician. 2009 Aug