A Very Brief Introduction To Alopecia

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Specimen Handling

- Scarring/non-scarring
  - Influences where the biopsies are taken
  - Influences how the biopsies are cut up
- LEVELS
- Special Stains
Biopsy Protocol For Scarring Alopecia

- If the Dermatologist suspects scarring alopecia then:
  - Two or three punch biopsies – 4mm in diameter taken from the “ACTIVE BORDER” of the scarring process
    - One biopsy examined by Vertical sections
    - One biopsy examined by Horizontal sections
    - If there is a third biopsy  Vertical sections for IMF (in cases of suspected SLE)
Biopsy Protocol for Non-Scarring Alopecia

- If the Dermatologist suspects non-scarring alopecia then
  - Two 4mm punch biopsies
    - One from the centre of the area involved
    - One from a non-involved area – used as a control
  - Both biopsies examined by horizontal sections
Why Horizontal Sections?
LEVELS
Special Stains

- Which may or may not be helpful (I do them on every case so that I get a good idea of what “normal” and “abnormal” are)
  - PAS ± PASD (PASF)
  - Alcian Blue
  - EVG
Basic Hair Follicle Anatomy

- Size
  - Terminal
  - Miniaturized

- Hair Cycle
Size

- **Terminal** Hairs
  - Long, thick hair with bulbs in the FAT
  - >0.06mm

- **Miniaturized/Vellus** Hairs
  - Thin, short, often hypopigmented, bulbs in the UPPER DERMIS
  - <0.03mm

- Intermediate
  - In between

- In practice vellus hair, the inner root sheath is as thick or thicker than the shaft
Phases

- **Anagen**
  - Active growing phase
  - 2-7yrs

- **Catagen**
  - Brief transitional phase between anagen and telogen
  - 2-3 weeks

- **Telogen**
  - 100 days at the end of which the shaft is shed
Anagen

- **4 Zones**
  - Hair Root = Bulb + Papilla
  - Lower follicle
  - Isthmus (Permanent)
  - Infundibulum (Permanent)
Hair Root

- Hair Bulb + Papilla
- Located in the fat
- Matrix surrounds the papilla
- Matrix cells – pool of undifferentiated cells
- Melanocytes live at the apex of the papilla.
- Depending on the location of matrix cells they give rise to
  - Hair shaft medullary cells
  - Hair Shaft cortex
  - Cuticle
  - Inner Root Sheath
Suprabulbar Zone

- Layers of the follicle begin to differentiate
  - Hair shaft medulla
  - Hair shaft cortex
  - Cuticular layer
  - Huxley’s layer of the IRS
  - Henle’s layer of the IRS
  - Outer root sheath
  - Vitreous layer (Basement membrane)
  - Fibrous root sheath
Isthmus

- Inferior landmark is the insertion of the arrector pili – Bulge – Stem Cells
- Superior landmark is the entrance of the sebaceous duct
- Mid portion the IRS desquamates – trichilemmal keratin
- Hair shaft has no secure attachment to the isthmus or infundibulum
Infundibulum

- Lined by epidermis with granular cell layer – continuous with the epidermis
Catagen

- Hair shaft and bulb retract upwards
- Leave fibrous streamer behind
- Hair shaft and IRS slide upward leaving behind ORS
- Trichilemmal ORS undergoes apoptosis
  - Get shrinkage of the ORS and thickening and wrinkling of the hyaline layer
  - APOPTOTIC figures seen
- Hair shaft base becomes club shaped & surrounded by pocket of trichilemmal keratin
- Bulb and papilla trail beneath
Telogen

- Retract to the level of the insertion of the arrector pili
- Secondary germinal unit situated below the telogen club
- Secondary germinal unit – asterix of palisading basaloid cells, NO Apoptotic figures, thick BM
- Telogen club – central mass of trichilemmal keratin surrounded by trichilemmal and fibrous root sheath
Differentiating Between the Phases

- Only possible from examination of the follicle below the bulge
  - Presence of the IRS
  - Apoptosis
  - Trichilemmal club
- Above this only see a keratinised hair shaft
Hair Biopsy Report

- Microscopic description of vertical sections
- Microscopic description of horizontal sections
  - Total hairs - 33
  - Terminal anagen hairs - 31
  - Terminal catagen/telogen hairs - 2
  - Miniaturised hairs
  - Anagen:Telogen percentages - 94%:6%
  - Terminal : Miniaturised - 2:1 or greater / 4:1 ????
- Follicular stelae
- Lymphohistiocytic infiltrate
  - Upper follicle
  - Lower follicle/ bulb
- Fibrosis/ Sebaceous glands
Classification of Alopecia

Non Scarring
- Androgenetic alopecia
- Alopecia areata
- Telogen effluvium
- Trichotillomania
- Traction alopecia
- Simple right?

Scarring
- Primary
  - LPP
  - Central Centrifugal Scarring Alopecia
  - CLE
  - Acne Keloidalis
  - Dissecting cellulitis
- Secondary
  - Deep burns
  - Radiation dermatitis
  - Cutaneous malignancy
  - Cutaneous sarcoid
  - Sclerosing dermatoses
  - Chronic infections
NO
Definition of scarring
- All forms of alopecia where hair follicles are permanently lost

Biphasic Patterns
- Non-scarring in the early phases demonstrated permanent hair loss in later phases
  - Androgenetic alopecia
  - Alopecia areata
  - Traction alopecia

Overlap of scarring alopecia
Take note of

- Decreased hair density
  - Scarring alopecia
  - Longstanding Androgenetic alopecia
  - Longstanding Alopecia areata
  - End stage traction alopecia

- Decreased hair density at the lower dermis
  - Telogen effluvium
  - Androgenetic alopecia
  - Traction alopecia
  - Scarring alopecia
  - Alopecia areata

- Normal hair density despite clinical reduction
  - Telogen effluvium
  - Trichotillomania
  - Androgenetic alopecia
  - Alopecia areata
- Miniaturisation of hairs
  - Androgenetic alopecia
  - Alopecia areata
- Increased % of catagen/telogen
  - Trichotillomania
  - Traction alopecia
  - Telogen effluvium
  - Alopecia areata
  - Androgenetic alopecia
Inflammation

- Involving lower half of the follicles
  - Alopecia areata
  - SLE
  - Dissecting cellulitis
- Involving the upper half
  - With vacuolar change
    - LPP
    - Chronic CLE
  - Without
    - Acne Keloidalis
    - CCSA
- Follicular dropout
  - With loss of sebaceous glands
    - Scarring alopecia
  - With associated sebaceous glands intact
    - Traction alopecia
    - Androgenetic alopecia
    - Alopecia areata

- Premature desquamation of IRS
  - CCSA
  - Acene keloidalis

- Trichomalacia
  - Trichotillomania
  - Acute traction alopecia
  - Alopecia areata
Androgenetic Alopecia
Clinical

- Symmetric thinning
  - Predominantly affecting crown, vertex and frontal regions
  - Relative sparring of the occiput
- No evidence of scarring
- FHx
- Normal number of total hair follicles
- Reduced number of follicles at the dermal/fat junction
- Increased numbers and percentage of miniaturised hairs at the upper dermis
- Fibrous streamers
- Slightly increased telogen count compared to with unaffected scalp
- No significant inflammation
Alopecia Areata

It’s not all about the bees
Clinical

- Patchy or circumscribed hair loss
- No evidence of inflammation
- May result in total scalp or body alopecia
- Lesions appear suddenly and may expand rapidly
Acute/Subacute
- Normal total number of hairs
- Peribulbar mononuclear cell infiltrate
  - Terminal Anagen and catagen bulbs
- Increased number of terminal telogen and catagen
- Increased number of miniaturised hairs
- Trichomalacia and marked narrowing of hair shafts

Chronic
- Majority of hairs in catagen and telogen
- Numerous miniaturised hairs
- Only mild inflammation – may be minimal
- May get follicle dropout
Lichen Plainopilaris
Clinical

- Various patterns of hair loss
  - Most common scattered foci of partial hair loss
- Perifollicular erythema and scaling
- Lichen planus lesions elsewhere on the body supports diagnosis of LPP
_interface lichenoid dermatitis affecting the infundibulum and isthmus

- Squamatisation of basal layer with artifactual clefting
- Colloid bodies and interfollicular changes of lichen planus sometimes found
- Perifollicular chronic inflammation and fibroplasia are sometimes the only changes seen – NOT diagnostic
- IMF – Grouped globular IMF (IgM) around follicular epithelium
Summary

- Horizontal Sections
- Levels
- A “normal” number of hair follicles doesn’t rule out alopecia
  - Miniaturised
  - Catagen/telogen
- Pay attention to Follicle stelae – don’t mistake for fibrosis
- Loss of sebaceous glands is an early sign of scarring
- Familiarise yourself with normal hair anatomy - don’t get hung up on differentiating catagen from telogen.