Diseases of bone, joint and soft tissue

Bone anatomy and physiology

1. Type: long, short, flat
2. Portion: epiphysis, physis, metaphysis,
   diaphysis
   medullary cavity, endosteum,
   cortical bone, cancellous bone,
   periosteum
3. Function: support, protection, hematopoiesis,
   storage of
   calcium (Ca), phosphate(P).
4. Component: Ca. P. (hydroxyapatite)
   osteocyte, osteoid, osteoblast, osteoclast,
   cartilage, ossification: (intramembranous, endochondral)

1.Osteoblast →form new bone

2.Osteoclast → remove and remodel old bone

Depend on factors:

a) Parathyroid hormone b) Vitamins D and C

c) Protaglandins d) interleukins

*1.Ca. P released from the bone enter the circulation
→ in balance with ionized ca. and p. in the serum

*2.Regulated by parathyroid hormone and vitamin D

Joint anatomy and function

1. Junction between two or more bones
2. Function: support, structure and movement
3. Type: a) synovial (or diarthrodial) joint – extremities
   b) synarthrose – head, trunk
4. Structure: capsule, ligament, synovium, meniscus, viscous fluid

Congenital disease

A) .**軟骨發育不全 *(achondroplasia)***

a) 遺傳, autosomal dominant

*突變, 佔80%

***FGFR3** (fibroblast growth factor receptor 3)

b) 軟骨生長障礙→軟骨內**骨生成**不良

(endochondral ossification)→

四肢 (extremities) 及顱 (base of the head)

軟骨生成不良

c) 外觀： a.四肢短, 但軀幹長度正常

(intramembranous ossification normal)

b.頭大, 前額突 (small jaws), 鼻脊低陷

*男：131.5公分

女：125公分

*健康者壽命同一般人

Congenital Disease

B) ***Osteogenesis imperfecta*** (成骨不全症)

1. deficiency in the synthesis of **type I collagen**, α-1,α-2 mutation
   →abnormal osteoid formation
2. abnormal collagen molecule→cannot
   form triple helix of collagen
3. type II: fatal, excess fragility,
   multiple fractures
   type I: fracture, increased during
   childhood; decreased after puberty
4. **blue sclera, hearing loss, thin skin,**
   dentinogenesis imperfecta,
   floppy mitral valve
5. too little bone *brittle bone disease
   ***fracture, hemorrhage**

Pathology A color atlas, 2000, Ivan Damjanov James Linder

Marfan syndrome

- Connective tissue disease
- Defect in fibrillin-1
- S/S: tall stature, long arm span, dislocation of the lens of the eyes, aortic and mitral valve incompetenec,

*weakness of aortic media→ dissecting aneurysm

骨折(fracture)

種類：1. simple(clean break)　2. comminuted (multiple bone fragments)

3. **compound (breaking through overlying skin)** = opened fracture

4. complicated (involving adjacent structures) －blood vessels, nerve etc.

*5. **pathologic fracture(病理性)骨折**:　fracture of bone　weakened by diseases　(eg: tumors, osteoporosis,　paget's diseases)

症狀：痛, 出血, 假性運動, 位置異常, 肌肉痙攣

骨折之修復過程

1. immediate effect: 軟組織破壞,
   出血, 血腫
2. early reaction: 最初4-5天, 發炎,
   吞噬作用, fibroblast及 新血管生成
(granulation tissue formation)
3. early bone regeneration: 一星期
   後, **callus(骨痂)形成**, 可能有
   軟骨及woven bone
4. well-formed callus－3週後
5. Remoldelling of callus－
   weeks to months
6. Final reconstruction－months later

造成骨折癒合延緩的因素

◎局部因素:

1. excessive movement of fractured end
2. extensive damage of fractured bone
3. poor intrinsic blood supply
4. severe local soft tissue injury or impaired blood supply
5. interruption of blood supply－hip joint
6. infection
7. interposition of soft tissue in fracture gap

◎一般因素: 1. elder

2. poor nutrition
3. **drug therapy (eg: steroid)**

Low Back Pain (腰背痛)

1.overstress to lumbar, caused by:

a.肥胖　b.腹肌無力　c.姿勢不良　d.壓力突然變化

2.機械創傷:

a.神經受壓迫　b.肌肉痙攣　c.韌帶扭傷

3.內臟牽引痛(referred pain)

退化性關節炎, 類風溼性關節炎,

關節黏連性脊椎炎, 骨質疏鬆症,

代謝問題, 癌症轉移

椎間盤脫出
(Herniated InterVertebral Disc) (HIVD)

- Disc因： degeneration

  使之向上, 下, 旁, 後各方向擠壓→使神經壓迫

- 好犯：**腰, 薦椎(L, S,)**→背, 腰痛

*坐骨神經痛(Sciatica): Disc壓迫坐骨神經→大腿背面痛

*馬尾症候群(Cauda equina syndrome)→厲害的雙腿痛, 以及膀胱, 腸道機能障礙

治療： 1.臥床休息, 止痛藥, 肌肉鬆弛劑, 消炎藥

2.復健(腹部肌肉訓練)

3.開刀

骨質疏鬆症(*osteoporosis*)

- 定義：全身性骨量減少(osteopenia), 但**礦物質及間質仍維持正常**
- 好犯：

primary :1.停經婦女(type I), 2.老者(type II)

secondary: any age and is related to identifiable causes

a) hormonal disturbances (副甲狀機能亢進) b) dietary insufficiency

c) immobilization (久病臥床者) d) drugs (eg.長期服用類固醇) e) tumors

f)其他：喝酒, 糖尿病, 肝病, 抽煙

- 實驗室：血清中的鈣, 磷及alk. phosphatase正常
- X-ray：骨骼支架減少形成空架子(empty frame)
- 併發性：**1.壓迫性骨折　2.創傷性骨折**
- 預防之道： a.多吸收鈣 b.多補充vit. D c.多運動 d.補充動情素(estrogen)

骨質疏鬆症(*osteoporosis*)

- 臨床表現

1. Back pain－因壓迫性骨折, 常見於胸椎及腰椎

   eg: a.胸, 腰椎的 vertebral bodies　b.肋骨

2. Kyphosis(駝背)－loss of height, abdominal protrusion

3.食慾喪失, 腹脹, 腸閉塞－retroperitoneal hemorrhage

4. Appendicular fracture－常見於極小的創傷之後引發

   好犯：a. proximal femur (intertrochanteric or intracapsular)

   b. proximal humerus

   c. distal radius

無血管性壞死(*avascular necrosis*)

1.好犯：**股骨頭部** (femoral head)

2.老年人, 男 > 女

3.**原因**：a.酒癮　b.類固醇治療　c.外傷　d.尿酸過高　e.放射線治療　f.血栓症

g.全身性病變: (eg. SLE,　polycythemia,　sickle cell anemia, **unknown cause)**

4. X光：可見骨壞死, 或有新骨形成

5.治療：開刀, 換人工關節

Adhesive capusulitis of shoulder(Frozen shoulder)
五十肩

- 關節包囊的外圍和關節面的
  軟骨相黏連(adhesion) 造成關節
  運動範圍受阻, 尤其是“向上舉”

病理：a.包囊和關節軟骨相連
b.肌肉萎縮(scapular及deltoid muscle)(三角肌)

治療：1.復建　2.開刀
*3.預防性－多運動

骨髓炎(osteomyelitis)(O.M.)-1

原因：1.病原由傷口或附近發炎的組織侵入骨髓腔

2.病原經由血(菌血症)傳入骨髓腔

病源：1. Staphylococcus aureus

2. Streptococcus

3. G(－) bacilli

好犯：a.毒癮者　b.海洋性貧血→輸血　c.長期洗腎病患

d.開放性骨折

位置：孩童(股骨), 成人(脊椎骨)

骨髓炎(O.M.)-2

- 病理變化：早期, 充血, 水腫, PMNs exudate

  感染可擴展→**骨膜下腔(subperiosteal space)→形成abscess→穿過soft tissue, skin→形成瘺管**

  ＊骨髓腔內壓力上升→壓迫血管→造成缺氧, 形成infarction

  →bone necrosis→pus+granulation tissue→abscess

  ◎inner side→**sequestrum**

  outer side→**involucrun(reactive new bone)**

  ◎Brodie's abscess：好犯於脛骨下側 (皮質骨內的膿瘍)

併發症： 1.癌症(squamous cell carcinoma or sarcoma)

2.慢性O.M.→類澱粉沈澱(amyloidosis)

處理： 1.急性O.M.→抗生素

2.慢性O.M.→清創術(debridement)+抗生素

Congenital acquired syphilis

a) **Treponema pallidum**

b) Infected mother → placenta → fetus → colonize the bones ⇒

syphilitic **osteochondritis and periostitis (saddle nose and saber shins)**

結核性骨髓炎
(Tuberculous Osteomyelitis)

- 病因：T.B. infection in lung or intestine→blood→spine, bone, joint

  *spine with T.B.→**Pott's disease**→

  psoas abscess(cold abscess)

  *joint with T.B.→T.B. arthritis

治療： 1.內科法: 服用抗結核菌藥

2.外科法:去除病源處及 畸形患處

退化病關節炎:*osteoarthritis(OA)*

1. the commost disorder of joint→cause chronic disability

2. ≧middle age　　3. clinical: pain and stiffness

4. basic pathology: **degeneration**

分類：a. primary OA: 原因不明

　　b. secondary OA: 已知病因, 而引發關節病變

骨關節炎(OA)的致病機轉

(一) A.**異常應力+正常軟骨**

eg. 1.微小骨折及骨再造 2.肥胖 3.發生性或解剖性異常
4.失去關節穩定性 5.外傷

(二) B.**異常軟骨+正常應力**

eg. 1.老化 2.發炎 3.遺傳或代謝疾病 4.免疫反應

(三) A及B均可造成

a.生物質失效, **膠原網狀結構受損**, 骨折→蛋白多醣崩解

b.細胞傷害, 分解反應加強, 蛋白分解腖增加, 腖抑制素減少,
蛋白多醣, **膠原及其他蛋白的破壞**

(四) 最後引發**軟骨破壞分解**→破壞性微粒滲入滑膜液→
使巨細胞在滑膜內行吞噬作用 →慢性炎症反應→骨再造

OA引起的骨贅
(osteophytic outgrowth))

1. **Heberden's node** —distal interphalangeal joint
2. **Bouchard's node** —proximal interphalngeal joint
3. cervical spondylosis

(椎關節強直)

—椎關節黏連

→壓迫周邊神經及脊髓

類風溼性關節炎(Rheumatoid arthritis)(RA)

1.好犯：20-40歲, 女性多, 任何關節, 尤其小關節

2.病因：**疑似病原感染及免疫反應**

3.臨床表現：

a.關節: 晨間關節僵硬(morning stiffness), 關節腫大, 紅腫,熱痛, **晚期可見關節粘連及變形**

b.好犯手指指骨間及手及腳的掌骨及指骨間關節

c.血中: **Hypergammaglobulinemia, Rheumatoid factor(+),(此為IgM)**

d.併發症: 心包炎, 肋膜炎等

4.滑膜發炎, 產生肉芽組織, 突入關節腔, 附於關節軟骨, **(稱為關節翳[pannus]**, 破壞骨骼及關節表面,最後使整個關節纖維化, 引起粘連及變形)

5.治療：使用**類固醇, 阿斯匹靈等**

比較 *osteoarthritis* 及 *Rheumatoid Arthritis*

	OA	RA
1. Type of disorder	Degeneration	Inflammatory
2. Site of initial damage	Articular cartilage	Synovial membrane
3. Age	Late middle age	3rd decade(any age)
4. Joint Affected	・Large weight bearing ・often single	・Small joint of hands and feet ・multiple
5. Systemic disease	・None ・ESR-normal ・RF(－)	++ ESR↑ RF(＋) secondary anemia

痛風(Gout)

1.好犯：中老年男性

2.病因：尿酸過高**(嘌呤[purine]代謝障礙**, 導致尿酸增加或尿酸排出障礙

*原發性, 隱性遺傳

*繼發性

3.臨床表現：a.好犯大腳趾, 紅腫熱痛。夜間較嚴重

b.血中尿酸: 女性> 6mg/100ml, 男性> 7mg/100ml

4.病理：a.尿酸鹽結晶沈澱, 形成病風石(tophi)

b.腎中可見尿酸鹽沈積及尿路尿酸結石

5.治療：飲用嘌呤少或無的食物

急性期：用秋水仙素減痛。Indomethacin解痛短期有效

關節黏連性脊椎炎
(Ankylosing spondylitis)

- 主犯：**sacroiliac, costovertebral and vertebral joints**

  男：女 = 8:1, young adult-middle age(< 40 y/o)
- **Rheumatic factor(－)**
- 是一種active chronic arthritis
- 病變處：calcific and osseous ankylosis→造成“不動”情形

  eg: **vertebral→bamboo spine**
- 臨床症狀：晨起僵化(morning stiffness), 運動後會改善

HLA-B_{27}常呈陽性

Classification of the bone tumor

A) Benign

1) Osteochondroma (exostosis) 2) Enchondroma 3) Chondroblastoma
4) Chondromyxoid fibroma 5) Osteoma 6) Osteoid osteoma

B) Benign tumor (locally aggressive or recurrent)

1) giant cell tumor (osteoclastoma) 2) osteoblastoma 3) chondroma
4) adamantinoma

C) Malignant tumor(locally aggressive, frequently metastasise)

1) osteosarcoma 2) chondrosarcoma 3) fibrosarcoma
4) malignant fibrous histiocytoma 5) Ewing's sarcoma

D) Metastaes. Commonly from

1) breast 2) lung 3) prostate 4) kidney 5) thyroid

E) Myeloma (multiple myeloma or solitary plasmacytoma)

骨軟骨瘤 *(osteochondroma)*

1.臨床表現：

a.**最常見的良性骨腫瘤** b.好犯年輕人 c.出現疼痛或壓迫周遭組織的症狀

2.病理：發生在**長骨骨后端**(metaphysis)附近，呈分葉狀

3.治療：外科切除

4.預後： a.若是單一病變, 預後良好 b.若是遺傳性多發性外生骨贅 (multiple heredity exostosis) 則可能發生惡性變化

骨源性肉瘤 *(osteogenic sarcoma, osteosarcoma)*

1.臨床表徵：

a.**次多的惡性 原發性骨腫瘤**(僅次於多發性骨髓瘤multiple myeloma)

b.佔惡性骨腫瘤20%

c.**好犯10-20歲, 尤其是男性(1.6~2.0：1), 75%**

d.好犯**長骨骨后端(metaphysis), 尤在膝關節處**, 局部出現疼痛, 腫大, 行動受限

e.早期出現血行性轉移(20%在肺臟)

2.病因：不明, 但和paget's disease of bone 及長暴露於放射線有關

***與視網膜胚細胞瘤(retinoblastoma)關係密切**

3.病理：來源為骨芽細胞, 依組織不同, 可分成: 造骨母細胞, 軟骨母細胞及纖維母細胞

腫瘤內可見：骨骼及類骨質(osteoid)的惡性基質

4. **X光：科德曼氏(Codman's)三角變化, sunburst appearance**

5.治療：截肢, 以防轉移, 並合併化學療法

6.預後：以前為25%, 現在提升到60%

Ewing's sarcoma

1. 5-20 y/o, M:F=2:1
2. Common bone: long bones, may be multiple
3. Location: **diaphysis, onion skin appearance**
4. Treat: chemotherapy
5. 5-year survival: 30%

Chondrosarcoma

1. 35-60 y/o, M:F=2:1
2. Common bone: **pelvis, ribs, vertebrae, long bones (proximal part)**
3. Location: diaphysis or metaphysis
4. Treat: surgery
5. 5-year survival: 20-80%

纖維發育不良 *(fibrous dysplasia)*

1.一種**漸進式, 纖維性增生**組織取代骨骼原有之組織之病變

2.臨床：

a.單一性病灶: 任何年齡層, **好犯肋骨, 股骨, 脛骨, 上頜骨出現疼痛, 骨折或變形**, 不出現內分泌問題, 約1%可變惡性

b.**多發病灶: 皮膚出現咖啡牛奶斑點 (cafe-au-lait spot), 常有內分泌失調,** 女性有假性早熟現象, 好犯3-10歲孩童

3.病理：纖維母細胞增多,**骨組織呈“人字型”**之中國字, **股骨呈“牧羊人拐杖** (shephord’s crook)”之變形或病理性骨折 **顱骨變形, 呈“骨性獅面(leontiasis ossea)**

4.治療：單一病灶: 外科刮除

多發性病灶: 保守療法,

因為成年後自癒

派吉特氏病 *(Paget's disease)*

1.又名**變形性骨炎(osteitis deformans)**

好犯40歲以上, 男性多, 可見局部或多處病變

好犯處: 顱骨, 鎖骨, 下肢長骨→骨變形及骨, 肌肉疼痛, **脊椎以胸, 腰部最多→背痛, 壓迫性骨折**

2.病因：可能**和slow virus infection有關**

3. Lab：**鹼性磷酸脢增加, 但ca.p.正常**

4. X-ray：脊椎之畫框(picture frame), 顱骨之棉花-羊毛狀(cotton-wool)

5.病理：**分期為 a.骨質溶解, b.混合性骨質溶解及增生, c.骨質增生最後出現鑲嵌型(masaic pattern)**

*骨髓腔血管增加, 易出血及明顯纖維化→疾病活動期,

其病骨表面皮膚溫度上升, 鏡下造骨及破骨細胞增加

****心輸量增加→心臟擴大, 心衰竭**

6.治療：給予calcitonin, 可抑制骨骼耗損

7. **5-10%會轉變成惡性骨癌**

巨細胞瘤 *(giant cell tumor)*

1.臨床表現：好犯20-50歲的成年人的
膝部之長骨
*成人：**好犯骨后(epiphysis)及骨后端]**
(metaphysis)
*青少年：好犯骨后端
◎無特殊之症狀
2. X光：蝕骨性(lytic)的變化, 狀似
肥皂泡沫 (soapbubble), 其中
無鈣化之表現
3.病理：細胞為多核性巨細胞及相類似
原始性結締組織細胞, 呈菱形或卵形
, 大多為良性
4.治療：外科切除或刮除
5.預後：**20-50%會再發**

Pathology A color atlas, Fig. 17-52, p379, 2000, Ivan Damjanov James Linder

骨之轉移性腫瘤

1.好犯：axial skeleton(eg: vertebral, pelvis, ribs, skull, sterum), proximal femur, 及humerus

*多發性

2.方式： a.直接侵入　b.經血管, 淋巴管移入

c.由脊髓處侵入(intraspinal seeding)

3.來源：**成人: 前列腺, 乳房, 腎臟, 肺臟及甲狀腺**

孩童: 神經母細胞瘤(neuroblastoma), Wilms' tumor, 骨肉瘤, Ewing's sarcoma

橫紋肌肉瘤

4. X-ray：溶骨性(lytic), 增骨性(blastic), 或混合性

Pathology 2nd edition, p. 562, 2000, Alan Stevens, James Lowe

腱鞘囊腫 *(ganglion)*

1.在關節或肌腱鞘處(tendon sheath)的平滑囊腫

2.好犯手腕(wrist)背部 *膝蓋後方的腘窩(poplitealfossa)
→Baker's cyst

3.病因：**運動傷害**, 在肌腱鞘處, 出現黏液性變性 (myxomatous degeneration)

4.治療：開刀切除, 病變處也可自行消除

Soft tissue tumors

Lipoma

1. The **most common soft tissue tumor**.
2. subcutis, large area (trunk, proximal extremity)
3. Angiolipoma, fibrolipoma
4. Well-encapsulated,
   yellow mass ->
   mature adipocyte
5. Excision,
   prognosis: good

Liposarcoma

1. Adult (40-60 y/o)
2. Site:
   a) deep soft tissue of proximal extremity
   b) retroperitoneum
3. Type:
   a) well-differentiated –> low-grade
   b) myxoid –> intermediate-grade
   c) round cell, pleomorphic, dedifferentiated –> high-grade
4. **Lipoblast**
5. Excision, prognosis: variable

Benign fibrous histiocytoma

- **Dermatofibroma,** sclerosing hemangioma
- mid-adult
- Site: dermis, subcutis,

  slow growing, painless
- Spindle cell -> storiform pattern

  blood vessel + hemosiderin

  foamy histiocytes
- **Infiltrating border**
- excision

Dermatofibrosarcoma protuberans (DFSP)

- low-grade malignant *** CD 34 (+)**
- young adult, site: trunk, extremities in the deep dermis and /or subcutis
- early, plaque or small nodule －> multinodular, protuberant
- **diffuse infiltrative margins** in deep dermis and/or subcutis
- spindle fibroblast-like cell, multinucleated giant cell , storiform pattern
- **local recurrence, 30-60%** => high-grade sarcoma
- metastasis, <5% －> lung, L.N.

Malignant fibrous histiocytoma

Aggressive, cytologic pleomorphic tumor

age: sixth and seventh decades

Site: arises in the musculature of proximal extremities and retroperitoneum

Gross: gray-white, unencapsulated

Size: 5-20 cm in diameter

Micro:

1.storiform—pleomorphic (the most common type) malignant spindle cell in storiform pattern

2. myxoid 3. inflammatory 4. giant cell 5. angiomatoid

*6. cutaneous variant – atypical fibroxanthoma

Malignant fibrous histiocytoma

Prognosis:

1) local recurrence: 40-60 %

2) metastatic rate: 30-50 % —lung, lymph node, liver, bone (Except for cutaneous tumor)

*angiomatoid type: common in adolescents and young adult

- Immunochemical & EM: maybe proved to be
  - 1. pleomorphic liposarcoma
  - 2. leiomyosarcoma
  - 3. rhabdomyosarcoma
  - 4. myxofibrosarcoma

Rhabdomyosarcoma

1 **The most common soft tissue sarcoma of childhood and adolescence**.

2 Site: head, neck, genitourinary tract, extremities

3 Type: **embryonal (66%)** , alveolar, pleomorphic

4 **Rhabdomyoblast**: round type: elongate: tadpole, strap cell

5 Treat: surgery, chemotherapy, radiation

6 Prognosis: embryonal > pleomorphic > alveolar

Synovial sarcoma

- 20-50 y/o, large joint (60-70% of lower extremity) esp. around the knee, thigh **s/s: deep-seated mass**
- Chromosomal translocation (X;18) and fusion gene (SYT-SSX)
- **Biphasic morphology** – epithelial cell, spindle cell
- Excision, Meta. to regional lymph node, lung, bone