

護理人員專題訓練課程

日期：94年9月27日
馬漢平醫師

Patient Profile

- Sex : Male
- Age : 29

Arrival At ER

- Triage : 2級
- Date : 94年1月6日
- Time : 10:50pm
- 入院方式 : 119救護車
- 護送人員 : 家人
- C.C at 檢傷 : 被打 , R` t leg pain
- AVPU ; BP : 137/68mmHg ;
PR : 126/min; RR : 18/min ;
BT : 35.4°C
- Past Hx : Depression

P.E

- Cons : clear
- H&N : Not pale or icteric
Neck : supple
- Chest & Heart : clear BS, RHB
- Abd : soft , no tenderness
- Ext : Freely, right thigh
ecchymosis

Order Sheet

- Voren & Gowell 1# tid x 3天
- MBD & OPD f/u at 1/7 8:40am

二次回診

94年1月8日

- Triage : 3級
- Time : 12:40pm
- 入院方式 : 自行步入
- 護送人員 : 家人
- C.C at 檢傷 : Right leg僵硬 (前兩天被打)
- AVPU ; BP : 124/61mmHg ;
PR : 82/min; RR : 18/min ; T : 36.2°C
SpO₂: 95%
- Past Hx : Psy

P.E.

- Cons : clear E4V5M6
- 右下肢: Diffuse swelling (non-pitting) with a/w over right thigh and leg ; numbness over r`t thigh & calf ; tenderness (-); D.P Pulse(+); warm & pink toes

Impression

- R` t thigh contusion
- R/O Compartment syndrome, right lower limb

Order

- X-ray : R` t leg
- N/S 60cc/hr
- CBC/DC/Plt
- PT/aPTT
- D-dimer
- Panel I
- Consult Ortho.

Ortho Consultation Note

- S : R` t low leg pain due to being hit
- O : Vital sign : stable
R` t low leg : Distal circulation : ok
Sensation : intact
R` t Knee : swelling (+),
Ecchymosis : (+)
- A : Contusion, R` t leg
- P : 1) R` t low leg elevation
2) Analgesics
3) OPD f/u

Lab

- D-D Dimer : 1.2 mg/L
- Glucose : 98 mg/dl
- AST : 617 U/L
- BUN : 100 mg/dl
- Creatinine : 7.7 mg/dl
- Na : 133 meq/L
- K : 5.9 meq/L
- CPK > 10000 U/L
- WBC : 14850 (N:67; L:14; Band:4)
- PT/aPTT : normal
- Hb: 18.2gm/dl
- Hct: 51.8%
- Plt : 239k
- Urine myoglobin : negative

Treatment

- 右腿抬高
- IVF hydration
- 止痛
- Consult Nephro.住院

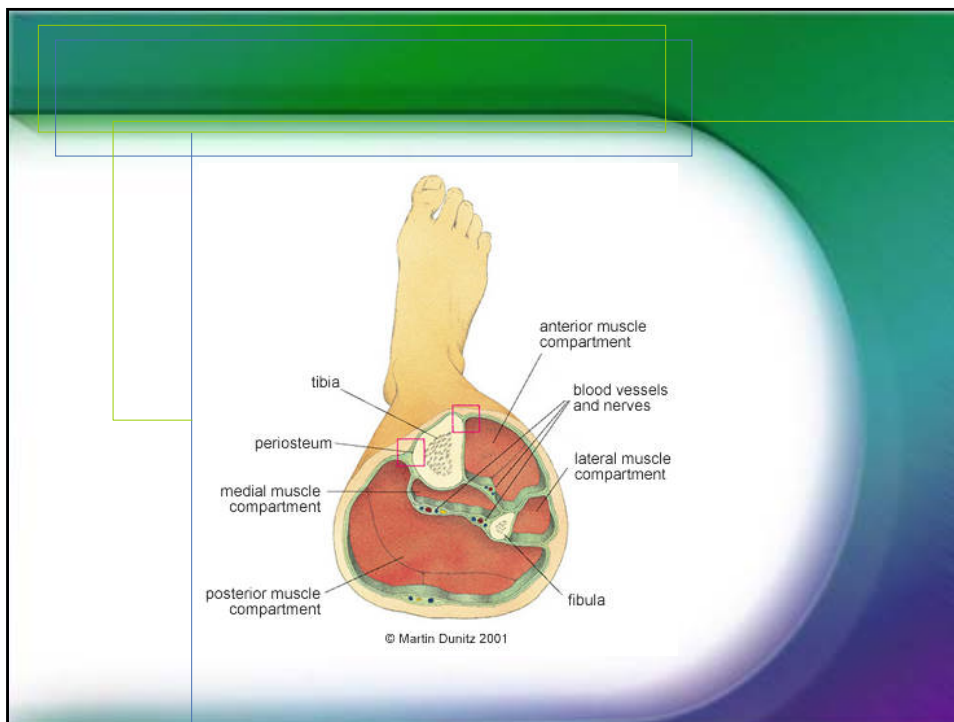
腔室症候群

什麼是腔室症候群？

(Compartment syndromes)

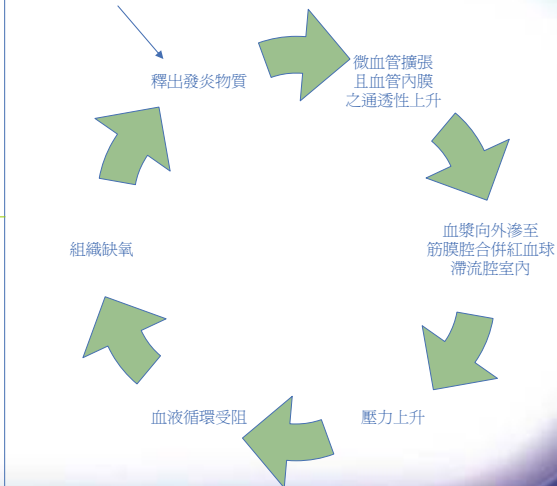
腔室的位置

- Upper arm
 - Anterior compartment
 - Posterior compartment
- Forearm
 - Volar compartment
 - Dorsal compartment
- Hand
 - Thenar and hypothenar compartment
 - Interosseous compartment
 - Lower extremity
 - Gluteal compartment
 - Thigh compartment
- Leg
 - Anterior compartment
 - Lateral compartment
 - Superficial posterior compartment
 - Deep posterior compartment



腔室症候群

組織受創



成因

- Decreased compartment size
 - Constrictive dressing and casts.
 - Closure of fascial defects.
 - Thermal injuries and frostbite.
- Increased compartment contents
 - Increased capillary permeability
 - Trauma, fracture, contusion
 - Postischemic swelling: lying on a limb

Table 3. Ways that compartment size can be reduced

- > fracture (tibia or fibula fractures, usually in the middle or distal third of the leg, or supracondylar fracture of the humerus)
- > crush injury
- > excessive exercise of a muscle group
- > surgical procedures including closure of fascial defects
- > major vascular surgery
- > bleeding disorders
- > compression bandages
- > constrictive devices such as a tight cast
- > insect sting or snake bite
- > burns
- > IV drug use
- > weightlifting
- > post-ischaemic swelling

All of the above generally lead to ischaemia due to the swelling in the compartment. Prognosis depends directly on the time interval between the onset of the intracompartment ischaemia and the start of effective treatment

腔室症候群

- 悄悄地發生 (insidious onset)
- 在傷害後的數小時到數天均有可能
- 若不及時處理，則會造成肌肉壞死、以及二度感染、神經缺損、壞疽、傷口不癒合以及骨折不癒合等等的合併症。
- 甚至於急性腎衰竭，休克，死亡。

Intramuscular pressure

- A normal resting intramuscular pressure is **0-8mmHg**.
- Pain and paraesthesia occurs at **20-30mmHg** (Tiwari *et al* 2002).
- An ICP of **30mmHg** is often used as a basis for performing a fasciotomy (Cooper 1992).
- If ICP exceeds **40mmHg**, emergency treatment is needed
- 每個人有不同的臨界值
- 會因血壓的變動有所變動

腔室症候群

- 當壓力上升至 50 mm Hg，血流量下降至70%。
- 而壓力到達 80 mm Hg時，血流只剩下5%。

組織可承受多久的壓力?

How long can tissues tolerate the increased compartmental pressure?

- Whitesides et al noted:
50 mm Hg的壓力可承受 4-8 小時
40 mm Hg的壓力可承受 6 小時
即出現早期神經肌肉的傷害
- Gelberman et al noted:
在正中神經施於 50 mm Hg 的壓力， 4小時即出現感覺及運動的異常

臨床症狀

典型的症狀為5P：

- *Pain*
- *Pallor*
- *Paresthesia*
- *Pulseless*
- *Paralysis*

疼痛(Pain)

- 疼痛是最早且最重要的症狀，但並不是最可靠的症狀。
- 腔室症候群疼痛不同於骨折的疼痛，它是“深的、無法定位、持續地、且常無法用一般止痛劑止痛的”痛。*(out of proportion to the injury)*
- 當我們拉扯患肢之末梢時，常會加重此一疼痛。

感覺異常(Paresthesia)

- 神經已受到影響
- 還處於可逆的時期
- 感覺異常的情況，通常比運動神經出現異常為早，但若已出現知覺喪失的現象，則表示是屬於較晚期的症狀。

蒼白(Pallor)

- 不一定會出現
- 受傷的肢體可能會出現發紫或小块紫青，此二種症狀的出現會較早，而一般蒼白的現象若出現則已屬晚期症狀，因為它表示動脈已有阻塞現象。

肢體癱瘓(Paralysis)

- 當出現此症狀時多半表示，缺血及缺氧之狀況可能已有一段時間，且永久之損傷常常已經發生了。
- 不可逆之肌肉壞死最早可在缺血後六個小時即發生。

脈搏消失(Pulseless)

- 疾病已到了晚期
- 所造成的組織傷害已是不可逆的。因為當腔室內的壓力增加超過靜脈壓力時，其動脈血尚可進入，但靜脈回流卻已終止了，故會出現脈搏消失的症狀。

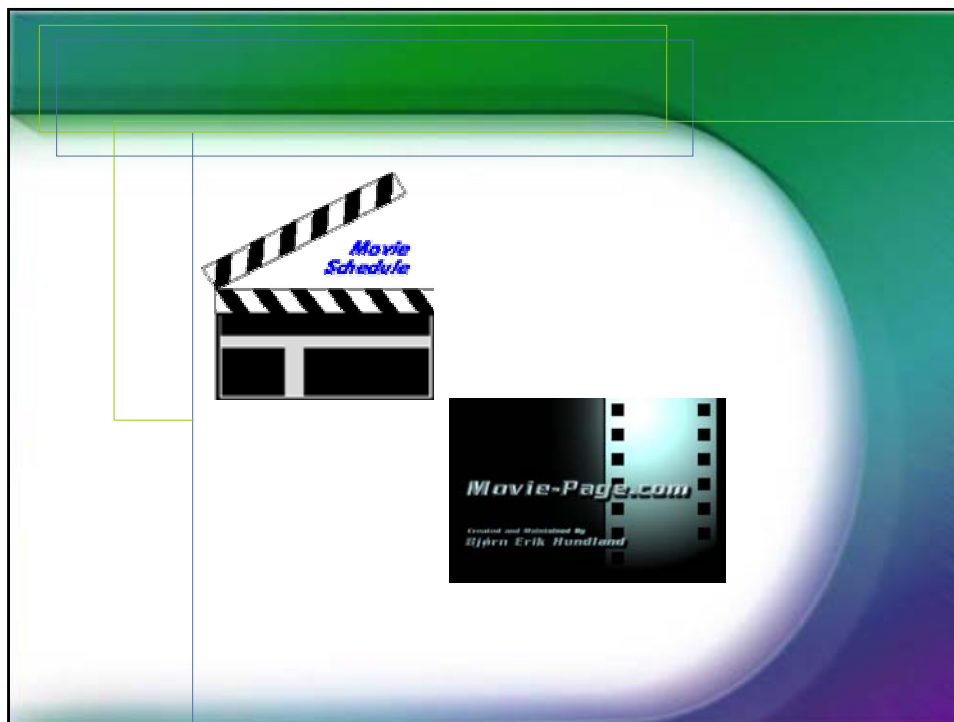
症狀的總結: "7P"

- **Pain disproportionate** to the primary diagnosis.
- **Pain worsened** by passive stretch of the affected muscles.
- **Pressure palpable** over the compartment.
- **Paresis** of affected muscles.
- **Paresthesias** in the distribution of affected nerves.
- **Pallor**.
- **Pulselessness** in the most severe cases

診斷方式

- 早期高度懷疑是診斷之鑰
- 單純要經由臨床之症狀來確定診斷腔室症候群非常不容易，且常會有延遲診斷之現象。
- 測量腔室內之壓力是診斷的黃金標準。Dr. Whitesides及其同僚提出了一種簡易的方式，來測量腔室內的壓力。

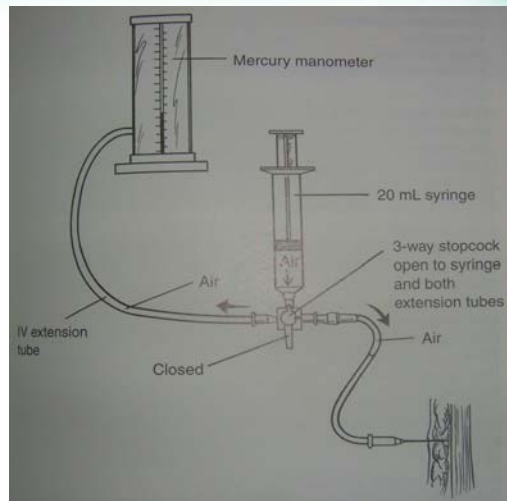
Table 4. Measuring ICP		
Type	Procedure	Advantages and disadvantages
Wick catheter	Uses polyglycolic acid suture wicks connected to a pressure transducer	Accurate and allows continuous measurement. Can lead to coagulation around insertion site, and wick can be left behind
Simple needle manometry	Uses an 18-G needle and a simple mercury manometer	A saline injection into the tissues is required while taking the reading. Can be disadvantageous because saline draws water towards it by osmosis. Less accurate than wick catheter
Infusion technique	Uses a syringe infusion pump to infuse 0.7ml saline through a 19-G needle	Allows continuous measurement. Infusing saline can increase pressure by 2-4mmHg
Slit catheter	Made from epidural catheter tubing. Slits are used to reduce clotting problems	Uses an infusion system but easier than wick method
Central venous pressure manometer	An 18-G needle is attached to a simple central venous pressure manometer	Quick, with no special equipment needed. Inaccuracies similar to those of simple needle manometer technique
Side ported needle	Allows measurement of several compartments using the same needle	Cannot be used for continuous monitoring
Fibreoptic transducer	Expensive and only available in specialist units	Easy to use. Allows continuous monitoring



Whitesides infusion technique



Whitesides method



實驗室及放射線檢查

- 急性期做腎功能的監測
- 由都卜勒超音波檢查脛骨之靜脈血流，可用來決定是否須行筋膜切開術。
- MRI 或超音波：肌肉裂傷
- 神經傳導檢查：nerve entrapment syndromes.

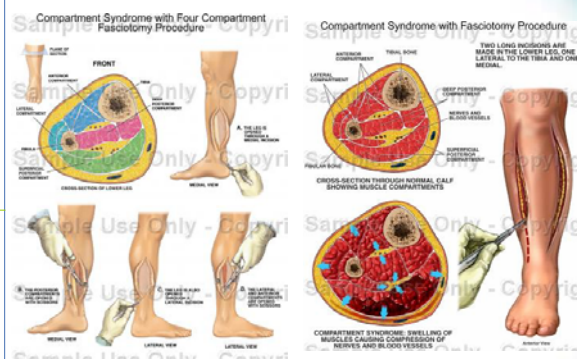
治療

1. 休息及藥物止痛
2. 抬高患肢 (只適用於早期)
3. 去除任何緊繃之紗布或石膏
4. 而外科醫師應隨時注意觀察是否須行筋膜切開術
5. 搭配高壓氧治療。

Fasciotomy



Fasciotomy



高壓氧治療？

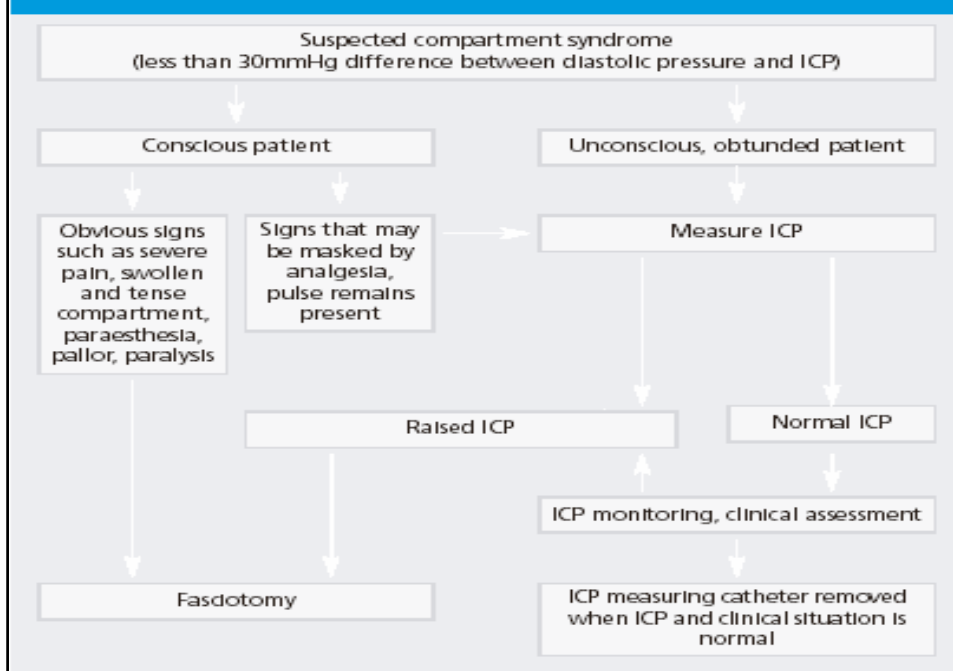
高壓氧治療對腔室症候群的治療原理

- 利用高氧濃度可使血管收縮而使水腫減退。因高氧濃度可以使血流減少20%，而血流減少20%，可以使水腫減少20%。

高壓氧治療對腔室症候群的治療原理

- 因水腫減少使微血管循環改善，而使氧氣之輸送更有效率。
- 使用高壓氧治療應該愈早愈好，最好在受傷後4至6小時內施行，如果手術已經延誤了，則應先給予高壓氧治療，然後再予以手術。

Fig. 5. Managing acute limb compartment syndrome



結論

- 腔室症候群是個急性且嚴重的臨床問題,若處理的不好,可能會使肢體壞死,甚至導致截肢的命運。
- 早期的診斷及治療是很重要的,若適當的予以治療,則可拯救肢體受不必要的傷害,也可使傷害程度降到最低。

