Common problems of the CV system

Chest pain

本講義表格資料取自Dains, J.E., Baumann, L.C., & Scheibel, P. (2007). Advanced assessment and clinical diagnosis in primary care. (3rd ed). St. Louis: Mosby.
圖片取自Seidel HM, Ball JW, Dains JE, Benedict GW. (1999). Mosby's guide to physical examination. St. Louis, MO: Mosby.

Pain

- The unwanted gift granted by God
- Indicating
  - Injury
  - Inflammation
- A warning sign

Pain threshold vs. Tolerance

- 疼痛閾值是一個刺激強度的臨界點，當刺激強度超過此臨界點時，就會產生疼痛的感覺。
- 疼痛閾值每個人不同，但基本上可以預測的。
- 疼痛忍受度(pain tolerance)是一個忍受的臨界點，當痛超過此臨界點，當事人就會尋求減少疼痛的方法。人與人之間疼痛忍受度差異相當大
- 疼痛的急性生理反應與交感神經活化的現象相似，包括血壓上昇、呼吸速率加快、出汗、瞳孔擴張
- 疼痛訊號的強度可被由大腦皮質所下傳的情緒及行為的訊息所調節，也可被其他周邊感覺所調節
- 慢性疼痛會改變突觸後神經元的反應強度以及疼痛路徑的組態

Type of pain

- Acute vs. Chronic
  - Acute pain在成功治療或癒傷後即不痛, 引起交感神經反應, 痛不超過6個月
  - Chronic pain在治癒後仍痛，痛超過6個月，無交感神經反應，主要為影響情緒與生活功能
- Somatic pain
- Visceral pain
- Referred pain
- Neuropathic pain

TABLE 52-1

Characteristics of Acute and Chronic Pain

Characteristic	Acute Pain	Chronic Pain*
Onset and duration	Abrupt onset; duration short, less than 6 months	Gradual onset; persistent, greater than 6 months
Intensity	Moderate to severe	Moderate to severe
Cause	Specific; biologically identifiable	Cause may or may not be well defined
Physiologic response	Predictable autonomic hyperactivity: increased blood pressure, pulse, and respiratory rate; dilated pupils; pallor; perspiration; nausea and/or vomiting	Normal autonomic activity
Emotional/ behavioral response	Anxious; unable to concentrate; restless; distressed but optimistic about relief from pain	Depression and fatigue; immobility or physical inactivity; social withdrawal; sees no relief in sight, expects long-term pain
Response to analgesics	Effective pain relief	Often ineffective pain relief

*Chronic malignant, chronic nonmalignant, and chronic intermittent pain.

TABLE 52-3

Essential Data to Collect for Assessment of Pain

Characteristic of Pain	Questions for Patient
Location	Where does it hurt? Does the pain radiate? Is the pain superficial or deep?
Mode of onset	When did the pain start? Did it begin suddenly or gradually? Was there any particular event that appeared to produce the pain when it began?
Pattern (timing, frequency, duration)	What time of the day does the pain occur? How often does it appear? It is constant or intermittent? How long does the pain last?
Aggravating and relieving factors	What seems to trigger the pain? What seems to make the pain worse (e.g., movement or changes in posture, coughing or straining, eating or drinking)? What seems to make the pain better (e.g., rest; sleep; changes in posture such as standing, sitting, lying down, or bending; food or antacids)?
Quality	What does the pain feel like (e.g., throbbing, dull, aching, sharp, stabbing, prickling, burning)?
Intensity	How strong is your pain? (Have patient rate the pain using a verbal or visual analog scale both before and after treatment.)
Associated symptoms	Are there any problems caused by your pain (e.g., anorexia, nausea, vomiting, insomnia)
Effects on lifestyle	Does your pain interfere with your activities at home, work, or normal social interactions? Has the pain affected your lifestyle in any way (e.g., eating, sleeping, sexual activity, driving)?
Methods of pain relief	What has helped control your pain in the past? What has not worked in relieving your pain?

Somatic pain

- 體表疼痛(superficial somatic pain)是因神經支配良好的體表區域(如皮膚及皮下組織)受到有害刺激所產生，這種痛是位置明確的，針刺的(tingling)，切割的(cutting)，燒灼的(burning)，或是尖銳的(sharp)
- 深部疼痛(deep somatic pain)是由一些神經分佈較差的深部組織所產生，如血管、骨骼肌、骨頭、關節等
  - 這些痛覺是鈍的(dull)、難以界定位置的，而且常輻射至周邊結構或產生自主神經症狀(噁心、出汗、心跳加速、附近骨骼肌反射性收縮)

臟器疼痛Visceral pain

- 是由中空器官的平滑肌及實質器官的包膜(capsule)所產生。
- 這些組織的神經支配不多，對牽扯(stretching)、發炎及缺血等情況敏感，所產生的疼痛是廣泛性的、位置不明確的，且常會移轉(refer)至其他地方。
- 臟器疼痛也會產生自主神經反應。許多器官的實質並沒有痛覺受器，如肺臟及腦部，這些器官拿刀子切下去也不會痛

疼痛轉移referred pain

- 臟器疼痛會有轉移現象，稱為轉移痛(referred pain)。轉移處為與該臟器在胚胎發育時同一來源之皮節(dermatone)。
- 轉移痛可藉由convergence-projection theory來解釋:臟器疼痛經由兩個路徑傳到中樞神經系統:體路徑(somatic pathway, parietal pathway)及true visceral pathway;因此臟器疼痛會轉移到同一胚胎來源之皮節

- 例如:闌尾炎在早期的疼痛會轉移到肚臍附近的T10皮節，到晚期變成腹膜炎時其疼痛就只經由somatic pathway傳導，因此疼痛就侷限於右下腹部

Neuropathic pain

- 神經性疼痛, 肇因於中樞神經系統或周邊神經系統的神經纖維受傷害，使得該神經纖維的感覺傳導能力受損。如皰疹後疼痛、糖尿病神經炎、三叉神經痛
- 神經傳導物質(neurotransmitters, neuromodulators)有些是誘發疼痛產生或增加疼痛強度(pronociceptive)， 有些是抑制疼痛產生或降低疼痛強度(antinociceptive)
- 突觸後神經元(postsynaptic nerve cell)接受訊息後，會產生一連串的化學反應，促進疼痛訊息的傳導，同時活化一些特定基因，這些基因被活化後會改變該神經細胞的結構。
- 從中樞PAG and PVG下傳至脊髓背角的substantia gelatinosa的疼痛調節路徑(descending pain modulating pathway)，可抑制脊髓處的疼痛訊號

圖片取自Prince SA & Wilson LM (2003) Pathophysiology: clinicnal concepts and disease process, 6th ed. St. Louis, Missouri:Mosby

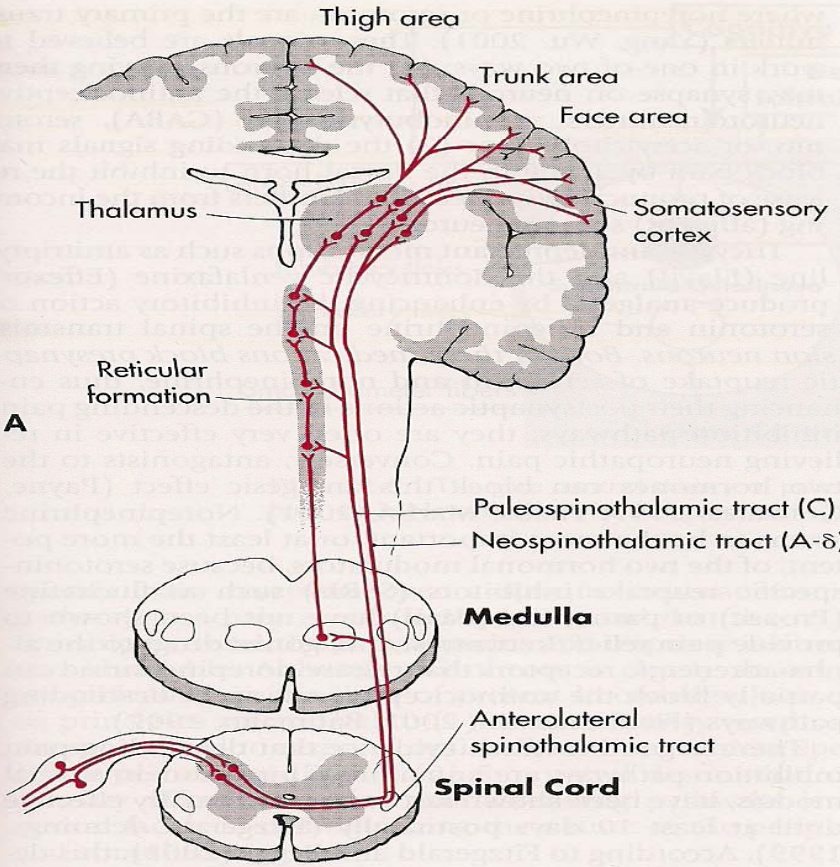
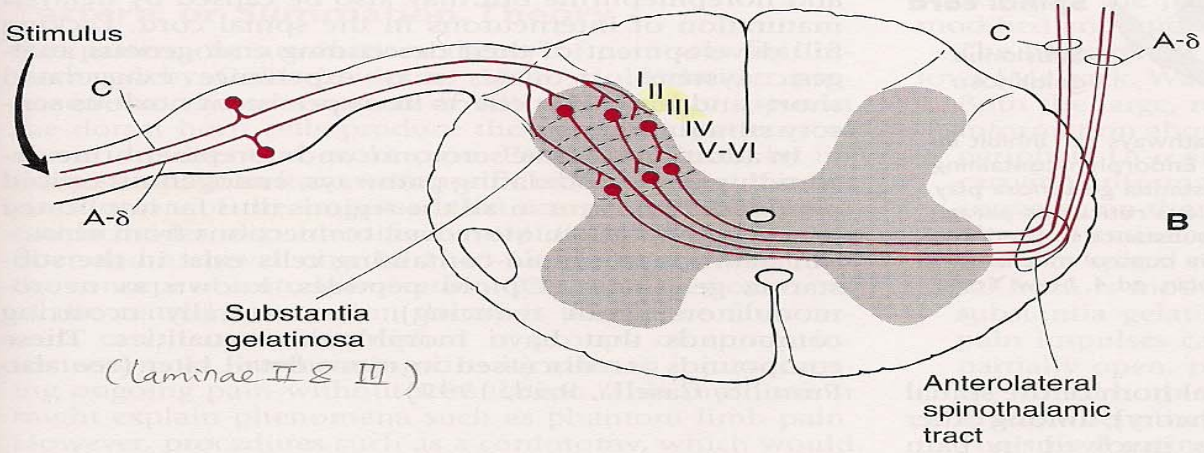


FIG. 52-3 Ascending pain pathways. **A**, The small A-δ and C pain fibers carrying acute-sharp and slow-chronic pain impulses, respectively, synapse in the substantia gelatinosa of the dorsal horn, cross the spinal cord, and ascend to the brain in either the neospinothalamic branch or the paleospinothalamic branch of the anterolateral spinothalamic tract. The neospinothalamic tract, principally activated by A-δ peripheral afferents, synapses in the ventroposterolateral nucleus (VPN) of the thalamus and proceeds directly to the somatosensory cortex of the postcentral gyrus, where pain is perceived as sharp and well localized. The paleospinothalamic branch, principally activated by C peripheral afferents, is a diffuse pathway that sends collaterals to the brainstem reticular formation and other structures, from which further fibers project to the thalamus. These fibers influence the hypothalamus and limbic system as well as the cerebral cortex. **B**, Afferent C pain fibers synapse primarily in the substantia gelatinosa (laminae II and III) of the dorsal horn, whereas A-δ pain fibers synapse primarily in laminae I and V.



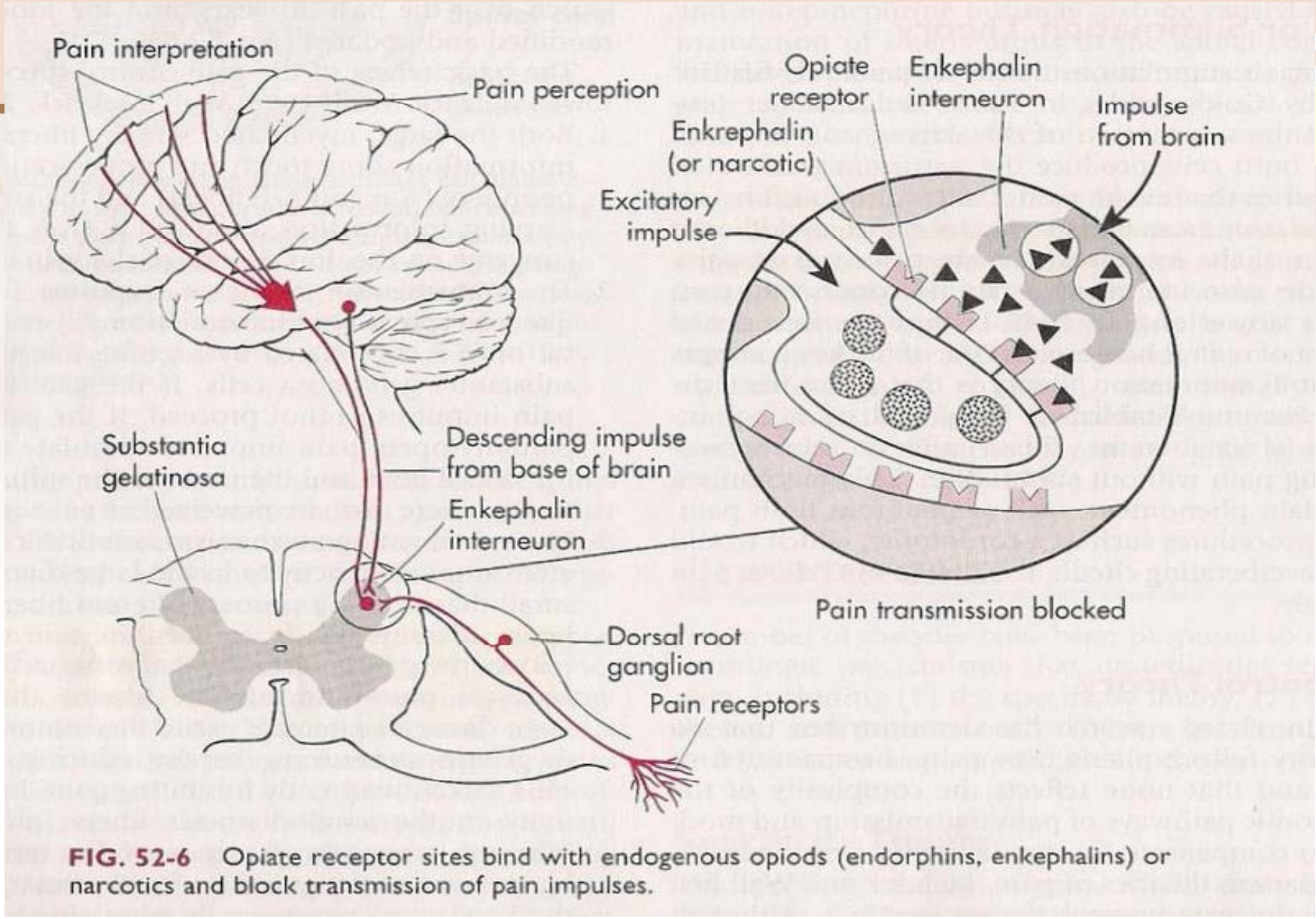


FIG. 52-6 Opiate receptor sites bind with endogenous opiods (endorphins, enkephalins) or narcotics and block transmission of pain impulses.

圖片取自Prince SA & Wilson LM (2003) Pathophysiology: clinicnal concepts and disease process, 6th ed. St. Louis, Missouri:Mosby

疼痛的評估

- By history taking
- By tool
- Observe verbal and nonverbal behavior
- Inspect and palpate the painful area.

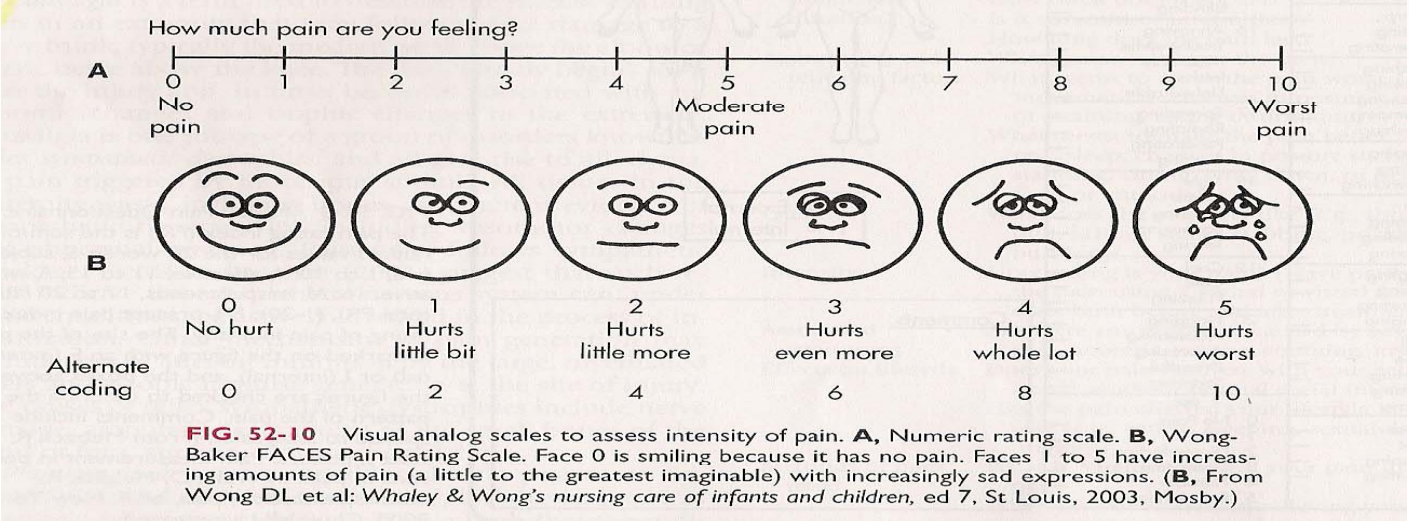


FIG. 52-10 Visual analog scales to assess intensity of pain. **A,** Numeric rating scale. **B,** Wong-Baker FACES Pain Rating Scale. Face 0 is smiling because it has no pain. Faces 1 to 5 have increasing amounts of pain (a little to the greatest imaginable) with increasingly sad expressions. (**B,** From Wong DL et al: *Whaley & Wong's nursing care of infants and children,* ed 7, St Louis, 2003, Mosby.)

Chest pain

Categorizing chest pain by critical level

- The most critical
  - AMI
  - Aortic dissection, tear
- Less critical-related to pleural inflammation
  - Pulmonary embolism
  - Pneumonia
  - Empyema
  - Lung cancer
- Least critical-related to muscle-skeletal strain
  - Ribs-vestibral, ribs-sternum clevicle-humeral
  - Intercostal m., pectois major, …

DIFFERENTIAL DIAGNOSIS OF *Common Causes of Emergent Chest Pain*

CONDITION	HISTORY	PHYSICAL FINDINGS	DIAGNOSTIC STUDIES
Acute myocardial infarction	Severe, oppressive, constricting radiating to left or right arm, neck, and/or jaw, lasting >30 min; diaphoresis, dyspnea, nausea; history of CAD, cigarette smoker, positive family history of CAD, history of elevated lipids	Hypertension or hypotension, cardiac arrhythmia, paradoxical S_2	Serial ECGs, serial cardiac enzymes, nuclear scan
Aortic dissection	Sudden, tearing pain in anterior or posterior chest; migrates to arms, abdomen, and legs	Pulse deficits, hypertension; possible neurological changes in legs; aortic diastolic murmur	Echocardiogram, angiography, CT scan/MRI, emergency referral
Acute coronary artery insufficiency	Severe, constricting retrosternal chest pain lasting >30 min; anxiety, diaphoresis, dyspnea; prior history of angina or MI	Restlessness, cool and clammy skin, tachycardia	ECG, isoenzymes
Pulmonary embolus	Acute onset; sense of doom; pleuritic pain, restlessness; mild to severe pain; hemoptysis; history of DVT, recent trauma to lower extremity, surgery; oral contraceptives	Fever, dyspnea, cough, tachycardia, tachypnea, diminished breath sounds; crackles, wheezing	PT/aPTT, ABGs, chest radiograph, ventilation/perfusion scans

DIFFERENTIAL DIAGNOSIS OF *Common Causes of Emergent Chest Pain —cont'd*

CONDITION	HISTORY	PHYSICAL FINDINGS	DIAGNOSTIC STUDIES
Pneumothorax	Sharp or tearing pain, may radiate to ipsilateral shoulder; dyspnea; children with asthma, CF, or Marfan syndrome at risk	Tachycardia; diminished breath sounds; crackles, wheezing	Chest radiograph, ABGs
Arrhythmias	Palpitations, dizziness, forceful heartbeats; history of CHD, fever, and medications (sympathomimetics and β-adrenergic agents); history of cocaine abuse	Hypotension SVT= tachycardia of 150-250 beats/min, sinus or ventricular tachycardia, irregular pulse	ECG during episode, Holter 24-hour ECG
Congenital coronary	In children and adolescents, history of moderate to severe chest pain during or following exercise; family history of early sudden death	May have murmurs, clicks, decreased lower extremity pulses, irregular pulse, BP	ECG, referral to pediatric cardiologist

ECG, Electrocardiogram; *CAD*, coronary artery disease; *CT*, computed tomography; *MRI*, magnetic resonance imaging; MI, myocardial infarction; *DVT*, deep venous thrombosis; *PT*, prothrombin time ; *aPTT*, activated partial thromboplastin time ;*ABG*, arterial blood gas; *CF*, cystic fibrosis; *CHD*, coronary heart disease; *SVT*, supraventricular tachycardia; *BP*, blood pressure.

DIFFERENTIAL DIAGNOSIS OF *Common Causes of Nonemergent Chest Pain*

CONDITION	HISTORY	PHYSICAL FINDINGS	DIAGNOSTIC STUDIES
Stable angina	Substernal chest pressure following exercise or stress and relieved by rest or nitroglycerin; nausea, SOB, diaphoresis, sternal chest pressure	Normal examination; possible transient S_4	ECG during episode of chest pain
Myocarditis	Chest pain; history of fever, dyspnea	Heart murmur, friction rub, fever	ECG, chest radiograph
Pericarditis	Sharp, stabbing pain referred to left shoulder or trapezius ridge, usually worse during coughing or deep breathing; may be relieved by sitting forward; history of viral or bacterial infection, autoimmune disease	Fever before onset of pain, tachycardia, pericardial friction rub	WBC, ESR, ECG, chest radiograph
Aortic stenosis	Chest pain on exertioin, substernal and anginal in quality; fatigue, palpitations, DOE, dizziness, syncope	Radial pulse diminished; narrow pulse pressure; loud, harsh, crescendo-decrescendo murmur heard best at second right ICS with patient leaning forward; thrill	Echocardiogram, ECG, chest radiograph
Mitral regurgitation	Exertional chest pain, fatigue, palpitations, dizziness, DOE, syncope	Holosystolic, blowing, often loud murmur heard best at apex in left lateral position and decreases with inspiration; murmur may radiate to axilla and possibly back	Chest radiograph, ECG, echocardiogram

DIFFERENTIAL DIAGNOSIS OF *Common Causes of Nonemergent Chest Pain —cont'd*			
CONDITION	**HISTORY**	**PHYSICAL FINDINGS**	**DIAGNOSTIC STUDIES**
Pneumonia	Productive cough of yellow or green or rust sputum, dyspnea, pleuritic pain	Fever; tachycardia, tachypnea; inspiratory crackles; vocal fremitus; percussion dull or flat over area of consolidation; bronchophony; egophony	Chest radiograph, sputum cultures, ABGs
Mitral valve prolapse	Chest pain, varies in location and intensity; palaitations; anxiety; nonexertional pain of short duration; history of Marfan syndrome	Arrhythmias, possible midsystolic click heard over apex; heard best while patient is in sitting or squatting position; thoracoskeletal deformity common in children	ECG, echocardiogram
Pleuritis	Mild, localized chest pain, worse with deep breathing; recent URI	Shallow respirations, local tenderness, pleural friction rub	None initially
Esophagitis	Substernal pain worse after eating and lying down; sour taste in mouth	Epigastric pain with palpitation	Esophageal pH
Chest trauma (rib fracture)	History of injury or trauma; pain with deep breaths; splinting of chest wall	Shallow respirations; chest wall pain on palpitation	Chest radiograph

DIFFERENTIAL DIAGNOSIS OF *Common Causes of Nonemergent Chest Pain —cont'd*			
CONDITION	**HISTORY**	**PHYSICAL FINDINGS**	**DIAGNOSTIC STUDIES**
Costochondritis	Pain along sternal border, increase with deep breaths; history of exercise, URI, or physical activity	Pain with palpitation over costochondral joints; normal breath sounds	None
Herpes zoster	Unilateral chest pain; painful rash	Normal breath sounds; vesicular rash along dermatome	None
Peptic ulcer disease	Epigastric pain 1 to 2 hours after eating, may be relieved by antacids; hematemesis and melena; risk factors include smoking and alcohol overuse	Tenderness to palpitation in epigastric area; signs of hypovolemia	Upper GI radiograph, upper endoscopy, CBC
Cholecystitis	Right upper quadrant abdominal pain radiating to right chest, often after eating high-fat meal; nausea and vomiting	Positive Murphy's sign; palpable gallblandder	Gullbladder ultrasound
Acute pancreatitis	Severe left upper quadrant abdominal pain radiating into left chest; pain worse in supine position; nausea, vomiting, fever	Left upper abdominal pain with palpation; hypotension	Serum analysis, pancreas ultrasound or CT scan

DIFFERENTIAL DIAGNOSIS OF *Common Causes of Nonemergent Chest Pain —cont'd*			
CONDITION	**HISTORY**	**PHYSICAL FINDINGS**	**DIAGNOSTIC STUDIES**
Lung tumors	Chest pain, SOB, cough, hemoptysis, history of cigarette smoking; history of pneumonia	Normal exam or diminished breath sounds over tumor and dull percussion sound over tumor	Chest radiograph, CT scan of chest, bronchoscopy
Cocaine use	Chest pain, SOB, diaphoresis, nausea; may relate to substance use	Tachycardia, hypertension	ECG, serial cardiac enzymes, drug screen
Psychogenic origin	Precordial chest pain, history of stressful situations	Normal exam	ECG, chest radiograph
Pleurodynia	Severe, acute onset, stabbing, paroxysmal, pleuritic pain over lower rib cage and substernal edge; headache, malaise, nonproductive cough	Pleural friction rub 25% of time; chest examination normal; fever usually present	None
Precordial catch syndrome	Sudden, sharp, nondistressing pain near apex of heart; seen in adolescence	Normal examination	None

SOB, Shortness of breath; *ECG*, electrocardiogram; *WBC*, white blood cell; *ESR*, erythrocyte sedimentation rate; *DOE*, dizziness on exertion; *ICS*, intercostal space; *ABG*, arterial blood gas; *URI*, upper respiratory tract infection; *GI*, gastrointestinal; *CBC*, complete blood cell count; *CT*, computed tomography.

Pleural chest pain

- 最可能導致胸痛的原因為肋膜炎（pleurisy）。
- 只有壁層肋膜是疼痛來源，臟層肋膜及肺實質視為沒有感覺的器官。
- 肋膜炎的通常是突然發作但可能已經進展一段時間，疼痛來自發炎部位且容易定位，感覺像被切斷般銳利的疼痛（cutting and sharp）且會隨咳嗽、打噴嚏或深呼吸加劇，
- 病人常呈現淺快的呼吸模式且進量減少不必要活動，有時在疼痛部位增加壓力可稍緩解疼痛。

Firstly, rule out life-threatening conditions

- Life threatening chest pain
  - Ischemic heart disease, myocardial infarction
  - Aortic dissection,
  - pulmoary embolism

	Ischemic origin	Non-ischemic origin
Character of pain	Constricting, squuezing, burning, heavy feeling	Dull or sharp pain
Location of pain	Substernal, midthoracic, radiates to arms, shoulders, neck, teeth, forearms fingers, interscapular	Left submammary and hemothorax area
Precipitating factors	With exercise, excitement, stress, after meals	Pain after exercise, provoked by specific body movement or deep breath.

Diagnostic reasoning-focused hx

- Is this a life threatening condition?
  - Can you describe the pain? What does it feel like, e.g. dull, sore, stabbing, burning, squeezing?
  - When does it start?
  - What were you doing when it started?
  - How long have you had the pain?
  - What other symptoms have you noticed?
- Does the patient have risk factors fro CAD?
  - How old are you?
  - Do you smoke?
  - Do you have high blood pressure? DM, or heart disease?
  - Do you have a hx of MI?
  - Has anyone in your family had a heart attack or stroke before the age of 60?

Focused hx (cont)

- If this is not a life-threatening condition, what does a description of pain tell me?
  - Is the pain acute or chronic?
  - What were you do when the pain first occurred?
  - Point to where the pain is located. Does it spread to any part of your body?
  - What seems to trigger the pain?
  - Does the pain awaken you from sleep?
- What do associated symptoms tell me?
  - Do you have a cough or a change in your cough?
  - Do you bring up sputum ? If so, how much and what color?
  - Do you have a fever?
  - Are you lightheaded or dizzy?
  - Do you feel like your heart is racing?

Focused hx (cont)

- Is the pattern of pain related to activity and position change?
  - Describe your recent physical activities.
  - Have you had any injury to your chest?
  - Does chest movement or position change make the pain better or worse?
- Is there a GI origin for the patient's chest pain?
  - Does the pain get better or worse from eating?
  - Do you have blood in your stools?
  - Have you vomited any blood?
- Could this pain be from a systemic cause?
  - Do you have any skin problem?
  - Do you have any chronic health problems?
- Family Hx.
- Emotional state.
  - In the past 6 months, have you had any spell or an attack in which you suddenly felt frightened, anxious, or very unease , or you heart suddenly began to race, you felt faint, or you could not catch your breath?

Focused PE

- Measure VSs and respiratory patterns
- Inspect
  - Observe general appearance
    - Grimacing, diaphoresis, palor, cyanosis, tachpnea, use of accessory muscles, splint chest wall
  - the skin
  - Observe spine for evidence of scoliosis
  - Examine the abdomen: GI disease related chest pain
    - Esophagitis,peptic ulcer, cholelithiasis/cholecystitis/ pancreatitis
  - Examine the extremities
    - Clubbing fingers, peripheral cyanosis, leg edema
- Palpate trachea and chest
- Percuss the chest
- Auscultate
  - breath sound
  - heart sound

Lab. And diagnostic studies

- EKG
- Treadmill
- Cardiac enzymes
- Activated partial thromboplastin time and prothrombin time
- Serum amylase, lipase
- CBC
- ABG
- ESR
- Esophageal pH
- Exercise myocardial perfusion imaging
- Radiography
- CT/MRI
- Echocardiography
- Abdominal ultrasound
- Bronchoscopy
- Ventilation/perfusion lung scan
- Pulmonary angiography
- Endoscopy

Q&A