Ischemia without CAD (Chapter 17)

- Prevalence
- Causes
- Stress testing
- Therapy
- Prognosis

Prevalence

- 10-30% of patients with chest pain have a normal angiogram
- Conditions associated with non-CAD ST depression include:
  - aortic stenosis
  - left ventricular hypertrophy
  - cardiomyopathy
  - mitral valve prolapse
  - cocaine

Prinzmetal’s Angina

- Syndrome of vasospastic angina
  - Pain can occur at rest
  - Usually in the morning
  - Pain is relieved by nitroglycerin
  - ST depression or elevation during stress testing; depression more likely to have CAD
  - May have an abnormal stress test but no CAD

Cardiomyopathy

- Abnormal cardiac contraction
  - elevated LVEDP
  - may have chest pain and ST depression, but normal CA
  - experience subendocardial ischemia with elevated ventricular pressure
  - poor long-term prognosis

Syndrome X

- Microvascular Ischemia
- Likoff et al, 1966 first labeled it “X”
- Typical ischemia
  - relieved by nitroglycerin
- no CAD
- Cardiac blood flow does not increase appropriately
  - reduced vasodilatory reserve
  - 60% are post-menopausal women

Mechanism of Syndrome X?

- Impaired endothelium function
  - endothelin does not cause VD with exercise
  - active substance of endothelin is nitric oxide
### Esophageal Dysfunction
- Chest pain caused by gastro-esophageal reflux (GER)
- Pain is difficult to distinguish from angina
- 60-70% of patients, pain is related to exertion
- May be distinguished from ischemia by having subjects fast before stress testing

### Psychological Causes
- Hyperventilation decreases CO$_2$ which is a potent coronary artery VC
- 40% of these patients have some sort of anxiety neurosis

### Stress Test Results
- False Positive Results are most common in
  - Men
    - younger, good exercise tolerance, atypical chest pain, ST depression is seen pre-exercise with hyperventilation
  - Women
    - younger, exercise duration is not helpful, atypical chest pain, ST depression with hyperventilation, abnormal EKG at rest

### Nitroglycerin Test
- Administer nitroglycerin before the stress test
  - anginal threshold is increased patients with CAD (increased exercise tolerance)
  - anginal threshold is not affected in non-CAD
  - Syndrome X, anginal threshold is decreased (decreased exercise tolerance)

### Therapy
- Depending on the cause
  - Nitrates (will relieve ischemia)
  - Calcium Channel Blockers
  - Beta blockers
- Check for non-cardiac causes of chest pain
  - chest wall
  - esophagous

### Prognosis
- Patients with chest pain but normal coronary arteries usually have a good prognosis
  - 50% improved in 2 yrs (Goodin)
  - 80% improved in 4 yrs (Bemiller)
## Conclusions

- Patients with chest pain but normal coronary arteries
  - some may have CAD but missed on angiogram
  - some may have a neurosis or a non-cardiac cause of the chest pain
  - 40-50%, have true ischemia
    - typical angina
    - reduced exercise capacity
    - relieved by nitroglycerin

## SILENT ISCHEMIA

*(Chapter 19)*

- Prevalence
- Mechanisms
- Detection
- Prognosis
- Clinical Strategy

## Prevalence

- 55% of men, the first indication of CAD is MI or death
- Autopsy data (asymptomatic 30-69 yr-olds) that have CAD
  - 6% of men
  - 2.6% of women
- Epidemiology data
  - 6% of aviation personnel (mean age 36)
  - 12% of asymptomatic men over 40 yrs

## Ischemia and Chest Pain

- Ischemia is a late event in the ischemic cascade
  - 75% of ischemic episodes cause no pain
  - the period of ischemia must last 5-7 minutes before pain is felt
  - wall motion abnormalities almost always precede chest pain

## Factors that influence the ischemic threshold

- subject’s pain threshold
- diabetes
  - 25% of diabetics who have a heart attack had silent ischemia
  - with nerve damage the patient doesn’t feel pain
- physical conditioning
  - exercise training can reduce or abolish exercise-induced ischemia

## Detection

- Silent Ischemia is difficult to detect because
  - The patient doesn’t feel pain and doesn’t seek out a stress test
  - false negatives occur during stress testing
    - specificity is about 90%, 10% are missed
  - Artery obstruction may proceed rapidly
Prognosis

- Prognosis is better than patients with typical ischemia – 50% better
- Prognosis worsens once the patient converts to typical angina
- Prognosis worsens with other signs/symptoms during stress testing

3 Types of Silent Ischemia

1. Those who never have pain
   - defective anginal pain signaling
2. Ischemic pain on some occasions
   - majority of patients
3. Ischemic pain on many occasions

The person at greatest risk may be #1, although the level of disease may be less. No warning!

Clinical Controversy

- Common criticism against stress testing asymptomatic clients
- Danger of missing someone with silent ischemia
- Clinical strategy: to stress test persons with the classical risk factors (suspicion of risk)

Therapy

- Repeated episodes of ischemia cause myocardial cell death and eventually impaired ventricular function
- Treatments
  - beta blocker meds
  - bypass surgery, angioplasty
  - diet and risk factor control

Therapy Controversy

- Do surgery on an asymptomatic patient?
  - Wait until symptoms appear and the “axe falls”?
  - Surgery for prevention?
- The answer is unclear at this time and up to the physician and the degree of other symptoms and impairment in the patient.

Conclusions

- Silent Ischemia is a hot topic today
- The problem is detection
  - ischemia is a protective mechanism
  - it’s absence increases the risk of a first-fatal cardiac event
- Positive stress tests should be followed-up even if the patient does not have ischemia and even though stress testing sensitivity is only 68%