Cardiac Marker – Cardiac Troponin I (cTnI)
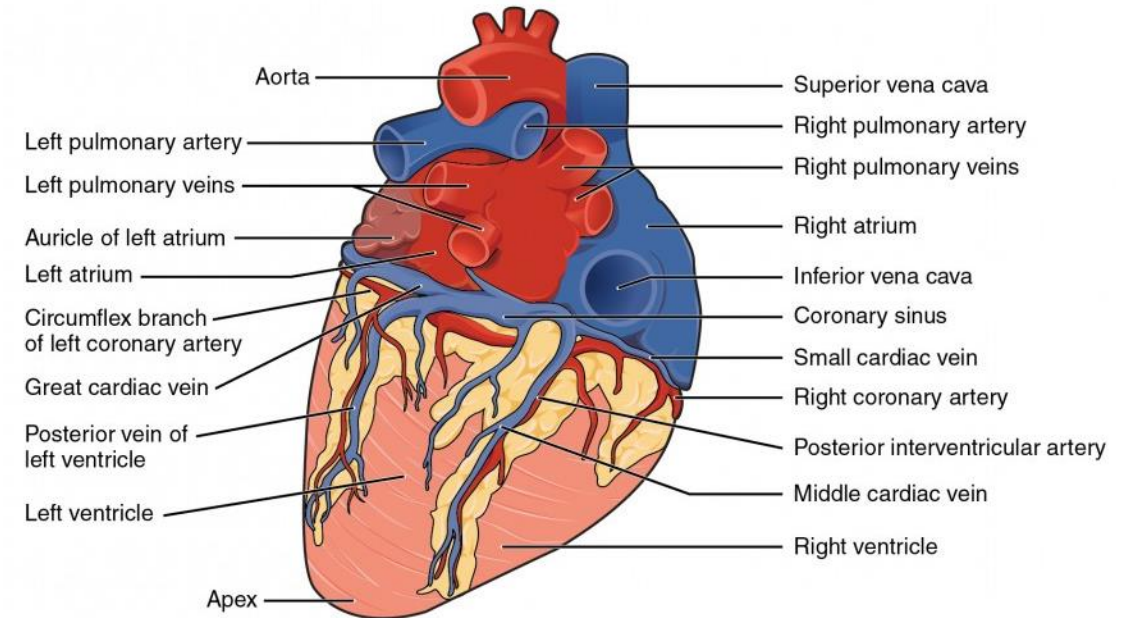
Contents

a. Cardiac Structure
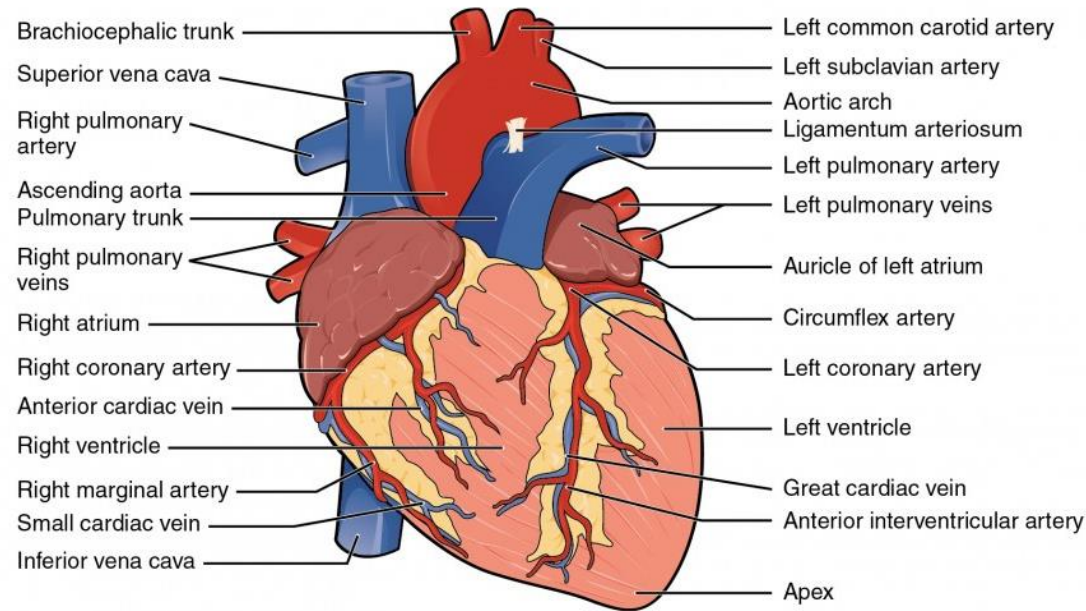
Anterior View

Posterior View

a. Cardiac Structure

**Cardiac Biomarkers**

❑ Cardiac Troponins – Markers indicating cardiac tissue damage

❑ Natriuretic Peptides (NPs) – Understanding markers of cardiac function

❑ C-Reactive Protein – Markers of cardiovascular inflammatory diseases

❑ Homeostasis of serum lipoproteins (high-density lipoproteins and low-density lipoproteins)

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b. Biological Characteristics

Cardiac Troponin I is a contractile protein found only in the heart muscle. It is one of the three subunits of the troponin complex (I, T, C) and combines with tropomyosin to form actin in the filaments of myofibrils.
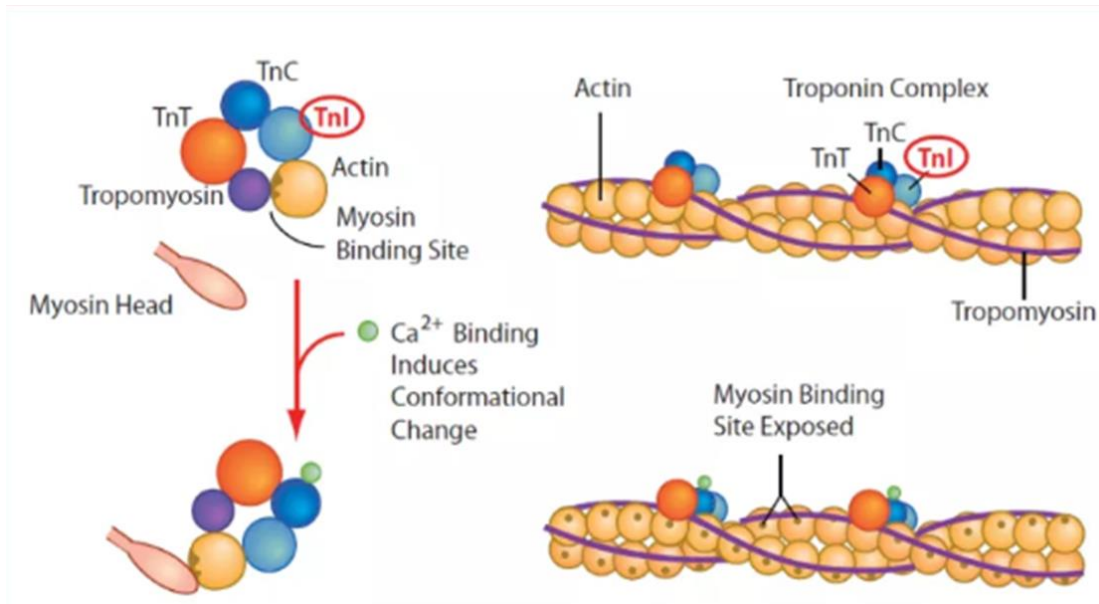
Studies have found that cTnI is free Troponin I (free TnI) which can interact with Troponin C (binary IC), Troponin T (binary IT), or both Troponin C and Troponin T (Triple ITC) compound.
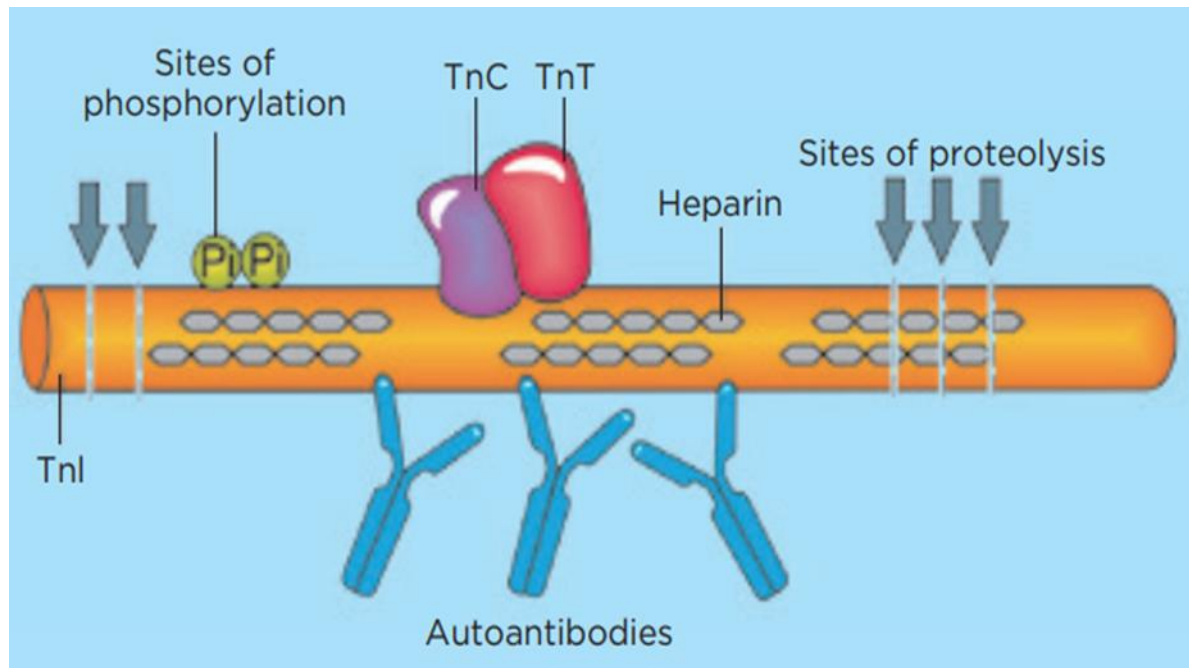
b. Biological Characteristics

cTnI with a molecular weight of 24,000 Da contains an additional 31 amino acid residue at the N-terminus.

In cardiomyocytes, cTnI exists as an I-C complex.

c. Clinical Application of cTnI

❑ It can be used as a biomarker of choice for myocardial infection

❑ Cardiac Troponin I has high specificity and sensitivity

❑ It can be used as a specific indicator of myocardial injury and can continuously detect positive results for a long time

❑ Cardiac Troponin is specifically distributed in myocardial tissue. After myocardial injury, cardiac troponin complex is released into the blood which is significant for detecting myocardial ischemia and used to risk grade in patients with acute coronary syndrome

c. Clinical Application cTnI

❑ Suspected Myocardial Infarction – The sensitivity and specificity are more than 90%

❑ Myocarditis – Viral, bacterial, Lyme disease, protozoal

❑ ICU Detection – Help to indicate whether myocardial infarction is complicated

❑ Cardiomyopathy – Dilated cardiomyopathy, hypertrophic obstructive cardiomyopathy, restrictive cardiomyopathy

❑ Helps distinguish between cardiac and non-cardiac causes of dyspnoea in dogs and cats

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c. Clinical Application of cTnI

❏ Non-cardiac critical illness can affect the heart, causing myocardial damage. Close follow-up is required after discharge.

❏ Critically ill patients with non-heart disease generally have higher mortality rates than patients with severe primary heart disease.

❏ The increase of various diseases can lead to the increase of cTnI levels:

- Systemic inflammation
- Parvovirus enteritis (parvovirus infection)
- Pancreatitis
- Cancer, lymphoma
- Uncontrolled hyperadrenocorticism (hypoadrenalism)
- Respiratory disease – anaemia (moderately significant)
- Gastric Dilatation Volvulus (GDV)
- Infectious diseases (leptospirosis, leishmaniasis, babesiosis, ehrlichiosis)
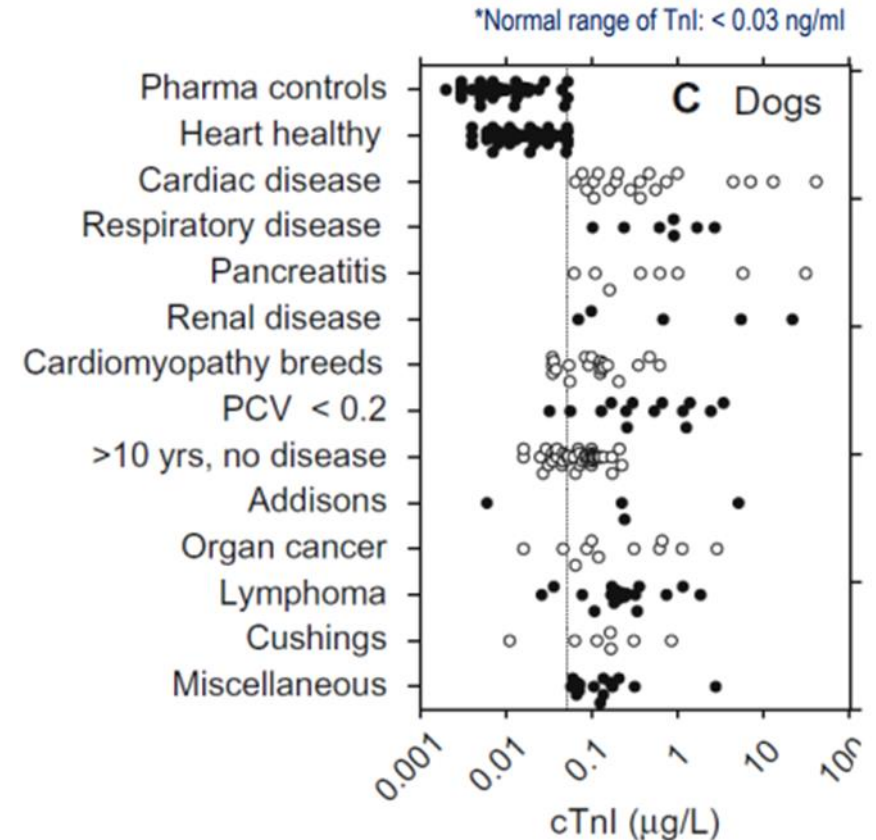
c. Clinical Application of cTnI

Heart Trauma

❑ Road Traffic Accident
❑ High-Rise Syndrome
❑ Chest Injury

cTnI is used to detect or exclude major blunt cardiac injury.

Heart Disease

❑ Mitral Valve Disease (MMVD)
❑ Dilated Cardiomyopathy (DCM)
❑ Congenital Heart Disease

cTnI indicates persistent myocardial injury (deterioration of cardiac function).

Non-Heart Disease

❑ Inflammatory Disease
❑ Tumour
❑ Stress

cTnI is used to detect myocardial injury in critically ill patients.

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c. Clinical Application of cTnI

❑ Direct cardiac trauma often occurs in extreme conditions (road traffic accident, high-rise syndrome, chest injury). Diagnosis of cardiac trauma is important because it can lead to cardiogenic shock, acute heart failure, life-threatening arrhythmias or structural damage.

❑ cTnI levels accurately indicate myocardial injury after trauma.

Normal Range of cTnI: <0.03 ng/mL
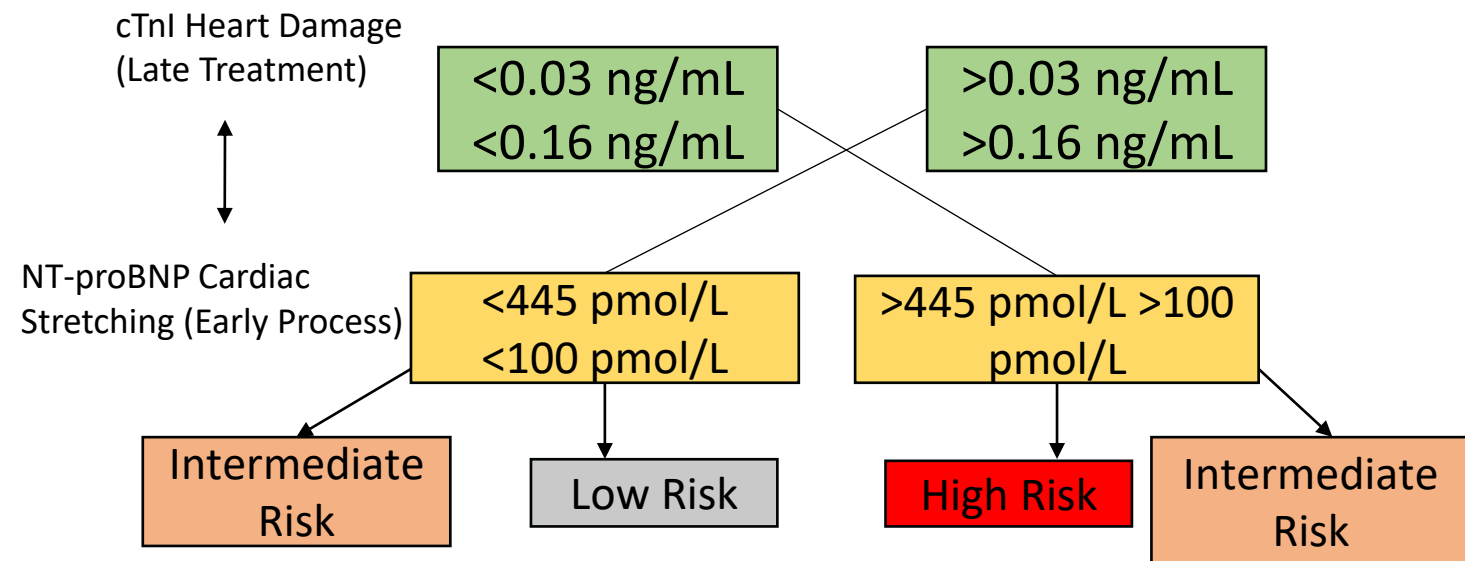**Half-Life of cTnI:** 1.85 hours

Sustained Release of cTnI from Damaged Tissue
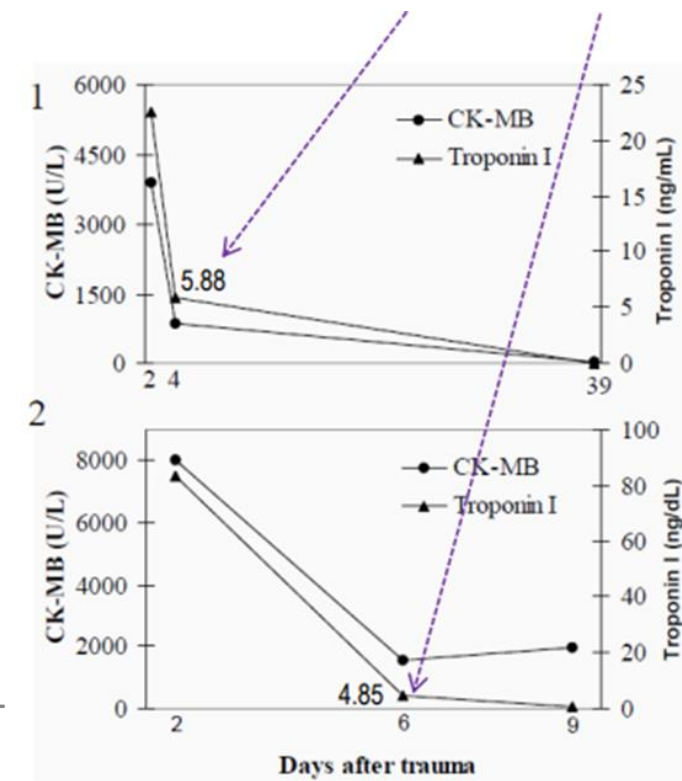
d. cTnI and NT-proBNP Detection Difference

Prognostic Algorithms for Heart Diseases of Different Severity

❑ cTnI and NT-proBNP should be measured in combination as a composite assessment.

   - cTnI for myocardial injury.

   - Myocardial stretched NT-proBNP.

❑ Combined measurements of cTnI and NT-proBNP were predictively superior to separate measurements.

❑ Monitor the rate of change of these markers every 6 months to learn more.

cTnI Heart Damage
(Late Treatment)

<0.03 ng/mL
<0.16 ng/mL

>0.03 ng/mL
>0.16 ng/mL

NT-proBNP Cardiac
Stretching (Early Process)

<445 pmol/L
<100 pmol/L

>445 pmol/L >100
pmol/L

Intermediate Risk

Low Risk

High Risk

Intermediate Risk

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d. cTnI and NT-proBNP Detection Difference

cTnI:

- ❑ DCM
- ❑ Thromboembolic Disease
- ❑ Hypertrophic Obstructive Cardiomyopathy
- ❑ Azotaemia
- ❑ AMI
- ❑ HCM
- ❑ RCM

NT-proBNP:

- ❑ HCM
- ❑ Cardiac Dyspnoea
- ❑ CHF
- ❑ MMVD
- ❑ CKD
- ❑ DCM
- ❑ PLE

Canine Cardiac Troponin I (ccTnI) Rapid Quantitative Test

Woodley have developed a rapid, accurate and reliable, highly sensitive detection method for Canine Cardiac Troponin I.

The InSight V-IA ccTnI Rapid Quantitative Test is a fluorescence immunoassay used with the InSight V-IA Veterinary Immunoassay Analyser for quantitative determination of ccTnI concentration in canine serum or plasma.

The test is mainly used for the diagnosis of cardiomyocyte injury.

It can be stored at room temperature.

Feline Cardiac Troponin I (fcTnI) Rapid Quantitative Test

Woodley have developed a rapid, accurate and reliable, highly sensitive detection method for Feline Cardiac Troponin I.

The InSight V-IA fcTnI Rapid Quantitative Test is a fluorescence immunoassay used with the InSight V-IA Veterinary Immunoassay Analyser for quantitative determination of fcTnI concentration in feline serum or plasma.

The test is mainly used for the diagnosis of cardiomyocyte injury.

It can be stored at room temperature.

Thank You

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