

# Update on Kawasaki Disease Cardiovascular Complications

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Anitha Parthiban MD, FAAP, FACC, FASE  
Director, Pediatric Echocardiography  
Associate Professor

Ward Family Heart Center  
Children's Mercy Kansas City



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## Outline

- Review the cardiac findings, acute and long term cardiovascular complications of Kawasaki disease (KD)
- Treatment of acute manifestations
- Long term follow up and surveillance
- Highlight recommendations in the new AHA guidelines

## Guideline

American Heart Association Scientific Statement  
**Diagnosis, Treatment, and Long-Term  
Management of Kawasaki Disease. *Circulation*  
2017; 135:e927-e999**

## KD and CVD

- KD is the most common cause of acquired heart disease in children in developed countries
- Untreated- coronary aneurysms occur in 25%, ~ 4% with timely initiation of IVIG treatment
- Mortality occurs from coronary thromboses and myocardial ischemia - peak mortality occurs between 15-45 days after onset of fever
- Hospital mortality ~0.17% , mortality > in children > 10 yr (1.4% vs 0.11%)

*Chang RK. Hospitalizations for Kawasaki disease among children in the United States, 1988-1997. Pediatrics. 2002;109:e87.*

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## KD and CVD

- SMR beyond acute illness elevated for all patients with cardiac sequelae (SMR, 1.86; 95% confidence interval, 1.02–3.13)

*Nakamura Y. Mortality among Japanese with a history of Kawasaki disease: results at the end of 2009. J Epidemiol. 2013*

- Sudden death /MI can occur from missed KD
- 5% of adults with MI < 40 yr had lesions of KD

*Daniels LB. Prevalence of Kawasaki disease in young adults with suspected myocardial ischemia. Circulation. 2012*

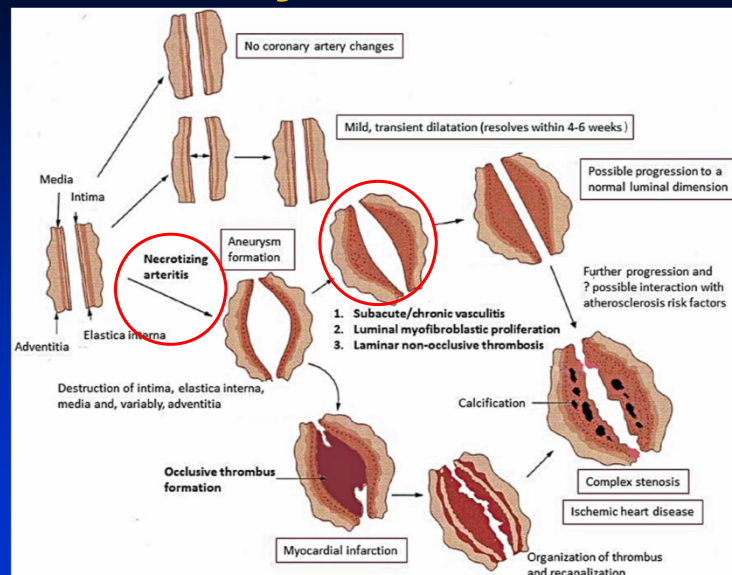
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## Cardiac Involvement in KD

- Myocardial inflammation ~ 50-70% patients
- Myocarditis occurs early and is transient
- ~25% have mitral regurgitation (mild-moderate)
- Aortic regurgitation is rare ~ 1% , may be related to aortic dilation
- Aortic root dilation ~ 10%
- Other arterial abnormalities – aneurysms/ thrombosis/ rupture- axillary, subclavian, brachial, femoral A.
- Peripheral gangrene

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## Coronary Arteries in KD



Ref : AHA guideline Circulation 2017

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## Coronaries in KD

- Range from dilation to giant aneurysms
- Proximal coronary segments
- Transient dilation ( Z score < 2.5) most common, resolves in 4-8 weeks
- 30-50% patients – dimensions in normal range but decrease with follow up
- Giant /large aneurysms asymptomatic unless causing ischemia – difficult recognition in infants, rarely rupture causing tamponade

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## Clinical findings

- Tachycardia
- Hyperdynamic precordium
- Murmur- systolic ejection murmur, mitral regurgitation , aortic regurgitation  
25% incidence of valvulitis ( mitral valve)
- Gallop – myocardial inflammation and edema
- Pericardial rub- pericarditis
- 5% - cardiovascular collapse (KD shock syndrome)

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## Electrocardiogram

- Prolonged PR
- ST- T wave changes
- Low voltage complexes ( myocarditis)
- Ischemia
- Malignant arrhythmia

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## Echocardiography

- Mainstay of cardiac imaging in KD
- Soon after diagnosis , but treatment should not be delayed
- Consider sedation ( < 3yrs, irritable child)
- **If initial quality poor, repeat sedated echo in 48 hrs**
- Initial echo in first week of illness- normal
- Guideline specifies standards of imaging including equipment and imaging protocol

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## Classification of Coronary Anomalies

Based on Z scores , not absolute dimensions

### Z-Score Classification

1. No involvement: Always  $<2$
2. Dilation only: 2 to  $<2.5$ ; or if initially  $<2$ , a decrease in Z score during follow-up  $\geq 1$
3. Small aneurysm:  $\geq 2.5$  to  $<5$
4. Medium aneurysm:  $\geq 5$  to  $<10$ , and absolute dimension  $<8$  mm
5. Large or giant aneurysm:  $\geq 10$ , or absolute dimension  $\geq 8$  mm

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## When to echo ?

- At diagnosis
- Uncomplicated patients – 1-2 weeks, 4-6 weeks
- Evolving coronary artery abnormalities (Z score  $>2.5$ )- 2/week till progression stops
- Large or giant aneurysms- 2/week during expansion, 1/week in the first 45 days of illness, and then 1/month for 3 months

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## **Limitations of Echo**

- **Difficult to detect thrombosis and stenosis**
- **Body size, acoustic windows**
- **Calcification can affect visualization**
- **Distal segments difficult to visualize**
- **CT angiography, CMR, invasive angiography**

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## **Acute Management**

- **Prevention and treatment of thrombosis**
- **Adjustment of anti-thrombotic therapy for evolving aneurysms**
- **Influenza vaccine to patients > 6 months/  
family members**
- **Varicella vaccine – consider alternate  
antiplatelet agent for 6 weeks**



## **Thrombosis Prevention**

- **Low dose aspirin (ASA) 3-5 mg/kg/day for 4-6 weeks after onset of illness**
- **Rapidly expanding or giant aneurysms ( Z score > 10) - add warfarin /LMWH for systemic anticoagulation**
- **Risk for thrombosis (aneurysms > 8mm, > 10 Z score, history of thrombosis) – triple therapy**
- **Ibuprofen and other NSAID's should be avoided**

## **Thrombosis Treatment**

- **Thrombolytic therapy – tPA**
- **Mechanical restoration of lumen at cardiac catheterization**
- **Monitor for bleeding**
- **Low dose thrombolytic + glycoprotein IIb/IIIa inhibitor( abciximab) for large thrombus burden**

## Long term outcomes

- Coronary artery events (thrombosis, stenosis, intervention, MI, death) linked to severity of initial coronary disease and progression
- 16 year follow up
  - Z score <10 and dimension <8 mm : 1%*
  - Z score ≥10 but absolute dimension <8 mm : 29%*
  - Z score ≥10 and an absolute dimension ≥8 mm : 48%*
- Giant aneurysms unlikely to regress

## Risk Stratification

Classification	Description
1	No involvement at any timepoint (Z score always <2)
2	Dilation only (Z score 2 to <2.5)
3	Small aneurysm (Z score ≥2.5 to <5)
3.1	Current or persistent
3.2	Decreased to dilation only or normal luminal dimension
4	Medium aneurysm (Z score ≥5 to <10, and absolute dimension <8 mm)
4.1	Current or persistent
4.2	Decreased to small aneurysm
4.3	Decreased to dilation only or normal luminal dimension
5	Large and giant aneurysm (Z score ≥10, or absolute dimension ≥8 mm)
5.1	Current or persistent
5.2	Decreased to medium aneurysm
5.3	Decreased to small aneurysm
5.4	Decreased to dilation only or normal luminal dimension

## **Long term management**

- **Begins 4-6 weeks post onset**
- **Preventing thrombosis and myocardial ischemia**
- **Surveillance for coronary disease and inducible ischemia**
- **Promotion of optimal cardiovascular health – life style modification, prevention of risk factors for atherosclerosis**

## **Primary Provider Role**

- ❖ **Who should follow up with cardiologist?**
- **Level 1- discharge after 4 weeks – 12mo**
- **Level 2- discharge after 12 mo, 3-5 yrs if dilation persists**
- **Level 3-5 – cardiology follow up needed**

## Primary Provider Role

- ❖ **Cardiovascular risk factor assessment and counseling**
  - Provide general counseling regarding healthy lifestyle and activity promotion at every visit
  - Assess BP, BMI, waist circumference, dietary counseling, smoking cessation, lipid profile per guidelines

## Primary Provider Role

- ❖ **Reproductive counseling**
  - Risk level 1,2- routine age appropriate counseling
  - Patients with aneurysms
    - *Avoid contraception with risk of thrombosis*
    - *Multi-disciplinary team for pregnancy*
    - *Change in thromboprophylaxis therapy during pregnancy*

## Long term management

### ❖ Activity Restrictions ?

- Risk level 1-3 – no restrictions
- Risk level 4-5
- *Self restriction*
- *High intensity activity or competitive sports guided by cardiac testing*
- *No contact sports if on dual antiplatelet therapy / anticoagulation*

## Medications

Risk Level	Low-Dose ASA	Anticoagulation (Warfarin or LMWH)	Dual Antiplatelet Therapy (ASA+Clopidogrel)	β-Blocker	Statin
1: No involvement	6-8 wk then discontinue	Not indicated	Not indicated	Not indicated	Not indicated
2: Dilation only	Continuation after 6-8 wk is reasonable	Not indicated	Not indicated	Not indicated	Not indicated
3.1: Small aneurysm, current or persistent	Continue	May be considered	May be considered as an alternative to anticoagulation	Not indicated	Empirical therapy may be considered
3.2: Small aneurysm, regressed to normal or dilation only	Continue, but discontinuation may also be considered	Not indicated	Not indicated	Not indicated	Empirical therapy may be considered
4.1: Medium aneurysm, current or persistent	Continue	May be considered	May be considered as an alternative to anticoagulation	Not indicated	Empirical therapy may be considered
4.2: Medium aneurysm, regressed to small aneurysm	Continue	Not indicated	May be considered	Not indicated	Empirical therapy may be considered
4.3: Medium aneurysm, regressed to normal or dilation only	Continue	Not indicated	May be considered	Not indicated	Empirical therapy may be considered
5.1: Large and giant aneurysm, current or persistent	Continue	Reasonably indicated	May be considered in addition to anticoagulation	May be considered	Empirical therapy may be considered
5.2: Large or giant aneurysm, regressed to medium aneurysm	Continue	Reasonably indicated	May be considered as an alternative to anticoagulation	May be considered	Empirical therapy may be considered
5.3: Large or giant aneurysm, regressed to small aneurysm	Continue	May be considered	May be considered as an alternative to anticoagulation	May be considered	Empirical therapy may be considered
5.4: Large or giant aneurysm, regressed to normal or dilation only	Continue	Not indicated	May be considered as an alternative to anticoagulation	Not indicated	Empirical therapy may be considered

## Summary

- **KD is the leading cause of acquired heart disease in developed nations**
- **Significant mortality and morbidity if not recognized and treated early**
- **Long term surveillance and management of coronary stenosis and ischemia is critical**
- **Cardiovascular risk assessment and lifestyle counseling is integral to the management**

