Education & Practice Online First, published on February 4, 2015 as 10.1136/archdischild-2014-306545

Fifteen-minute consultation: rheumatic fever

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Received 10 July 2014
Revised 10 October 2014
Accepted 12 January 2015

ABSTRACT

Objective To present a structured approach for an outpatient consultation or inpatient assessment of a child with possible rheumatic fever.

Method Review of literature and description of diagnostic and therapeutic approach.

Conclusions A focused history and examination is key to establish the cause and draw a management plan for rheumatic fever.

A 7-year-old child is assessed for possible rheumatic fever.

WHAT SHOULD YOU COVER IN THE HISTORY?

The initial infection of pharyngitis produces a sore throat, fever, malaise, headache and an elevated leucocyte count, although often patients have few symptoms.[1]

The major criteria for diagnosis are carditis, polyarthritis, chorea, erythema marginatum and subcutaneous nodules. These are referred to as the Duckett Jones criteria (table 1).[2]

PATHOPHYSIOLOGY

The group A β haemolytic streptococcus (GABHS), otherwise known as a *Streptococcus pyogenes,* has been isolated as the infectious trigger of acute rheumatic fever (ARF). This organism is a Gram-positive coccus known to colonise the skin and oropharynx and spreads following a latency period of 2–5 weeks.[1]

The pathophysiology for the development of rheumatic heart disease (RHD) from ARF is the culmination of a triad of factors; the rheumatogenic group A streptococcal strain, a genetically susceptible host and a deviant host immune response, typically in children from 5 to 11 years old.[1] Ultimately this culminates in scarring of the valve tissue and chronic RHD.[3]

Studies have shown that multiple genetic factors are responsible for 60% of the risk of developing rheumatic fever.[3] The remaining 40% can be attributed to streptococcal pharyngitis and conditions of poverty, both of which aid the development of ARF.[4]

Also thought to play a role is tumour necrosis factor-α, an inflammatory cytokine, also located on chromosome 6, that appears to be upregulated in many patients. This results in an increased inflammatory response and ensuing progression to ARF.[5]

Table 1 Duckett Jones criteria for diagnosis of rheumatic fever

Major criteria	Minor criteria
Carditis	Fever
Polyarthritis	Arthralgia
Chorea	First-degree heart block
Erythema marginatum	Elevated acute phase reactants
Subcutaneous nodules	

Positive diagnosis requires the presence of two major or one major and two minor clinical criteria, in addition to evidence of a recent streptococcal infection.

PRESENTATION

Arthritis is the most common presentation of ARF, occurring in 60–80% of patients.[1] Typically the pain is polyarticular, migratory and non-deforming, with the large joints primarily affected. Erythema marginatum presents as a transient rash while subcutaneous nodules can be found on the extensor surfaces of the arms and legs as painless, flesh-coloured bumps (table 2, figure 1).

RHEUMATIC HEART DISEASE

Carditis occurs in about 50% of patients. Classically RHD presents with onset of shortness of breath, exercise intolerance and disproportionate tachycardia, associated with fever (box 1).[1]

Valvulitis occurs in the mitral valve in 65–75% of cases, aortic valve in 7–30% of

To cite: Markham R, Tulloh R. *Arch Dis Child Educ Pract Ed* Published Online First: [*please include* Day Month Year] doi:10.1136/archdischild-2014-306545

Table 2 Differential diagnosis of acute rheumatic fever

	Presentation		
	Polyarthritis and fever	**Carditis**	**Chorea**
Differential diagnosis	Septic arthritis	Innocent murmur	Systemic lupus erythematosus
	Connective tissue and other autoimmune disease	Mitral valve prolapse	Drug intoxication
	Viral arthropathy	Congenital heart disease	Wilson's disease
	Lyme disease	Infective endocarditis	Tic disorder
	Sickle-cell anaemia	Hypertrophic cardiomyopathy	Choreo-athetoid cerebral palsy
	Infective endocarditis	Myocarditis—viral or idiopathic	Encephalitis
	Leukaemia or lymphoma	Pericarditis—viral or idiopathic	Familial chorea—including Huntington's
	Gout and pseudogout		Intracranial tumour
			Lyme disease
			Hormonal

cases with the tricuspid valve affected in 10% of cases and involvement of the pulmonary valve being rare.[2 6–9]

INVESTIGATIONS

Blood tests: erythrocyte sedimentation rate and C-reactive protein are used as non-specific markers of inflammation, useful for monitoring and as indications of resolution.

Antistreptolysin O titre: is often used to determine evidence of active streptococcal infection (>400 units/mL being a significant reading in children).

Throat swab: can be used to look for evidence of GABHS, but remember that many normal children carry this as commensal.

Electrocardiogram: may show prolonged PR interval (>0.16 s) as sign of first-degree heart block.

Echocardiography (two-dimensional and colour flow): is able to detect subclinical cases of carditis showing ventricle dysfunction, valve regurgitation and pericardial effusion.

MANAGEMENT AND INTERVENTIONS

Early prevention

Improvement of socioeconomic status and prevention of overcrowding through better housing reduce the risk of spread of infection. Improving nutritional status enhances immunity and the capacity of individuals to resist and fight infection. Populations should be encouraged to seek medical advice and treatment for children suffering from a sore throat, allowing a greater chance for preventative measures to be successful.[10 11]

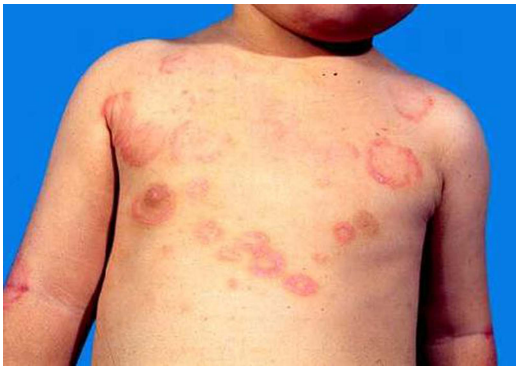

Figure 1 Erythema marginatum.

Primary prevention

In the absence of a vaccine, primary prevention involves the early diagnosis and treatment of GABHS.[12] Some studies have shown that in 90% of cases of RHD, children are asymptomatic and do not have audible murmurs.[9] Screening programmes have been developed to target this silent, but significant, rheumatic carditis of insidious onset.

The standard treatment is a 10-day course of oral penicillin V. However, if there is a risk of non-compliance, a single intramuscular injection of benzyl penicillin G (BPG) will be better.[2]

Acute treatment of symptoms

Aspirin—first-line treatment: 80–100 mg/kg per day for 4–6 weeks. Causes marked improvements in joint manifestations within 24–48 h.[2]

Steroids have shown no enhancement in recovery and have greater risk of side effects.

Box 1 Signs of carditis

- Pericardial rub
- Tachycardia
- Apical systolic murmur
- Basal diastolic murmur
- Congestive heart failure

Secondary prevention

Prophylactic antibiotics are given to prevent recurrent ARF until the age of 21 if no carditis (or 5 years since last attack) or 40 years if carditis present (or 10 years since last attack).[1] They are given in the form of intramuscular BPG injections every 3–4 weeks. An oral regime has been proven to be equally effective, but intramuscular injections guarantee long-term compliance and adequate serum penicillin levels.[13]

TERTIARY MANAGEMENT OF RHD

Late effects

Onset of these symptoms is usually late, between the ages of 20 and 50 years. Clinical diagnosis of chronic RHD is based on the pathological findings of a valvular heart murmur, and thickened valve leaflets and chordae, mitral annular dilation and chordal elongation.

There is no definitive treatment for chronic RHD, only medical and surgical interventions designed to address the clinical consequences of established disease—heart failure, atrial fibrillation, ischaemic embolic events and infective endocarditis.[1]

Surgery or interventional cardiac catheterisation is indicated to repair or replace severely damaged heart valves when heart failure cannot be controlled with maximal medical therapy or when severe valvular lesions become symptomatic. Atrial fibrillation is treated through rate or rhythm control, and anticoagulation with warfarin if there is a high risk of embolic complications.[9]

FUTURE OUTLOOK

RHD is the leading cause of acquired heart disease worldwide under the age of 25 years, with an estimated 15.6–19.6 million cases worldwide. Anecdotal reports indicate a resurgence in the numbers in the UK. Control and management of RHD faces four fundamental challenges.

1. Greater understanding of disease pathogenesis, with the aim to improve diagnosis and treatment, is critical.[11] Methods of diagnosis and treatment, although revised and updated, have not changed significantly since the mid-20th century. Unravelling the immunology and the genetics underlying the disease process is believed to be the key.
2. Earlier identification of RHD, so that preventive measures have a higher chance of success. The only method of detection in the early asymptomatic stages is screening, but questions still remain about its cost-effectiveness and practicality.[11]
3. A vaccine against GABHS. The search for one began in the 1950s and has to date produced about 20 different products, although none has yet reached clinical use or stage II of clinical trials. The search for an effective vaccine is being led by the Global GAS Vaccine Group, partnered by the World Heart Federation (WHF) Working Group on RF and RHD.[10]

WHF Working Group on RF and RHD.

The establishment of the WHF working group on RF and RHD in July 2011 began the process of overcoming these challenges. The aim is to achieve a 25% reduction in premature deaths from RF and RHD by 2025 in people younger than 25 years of age.

To achieve this, a number of areas are being targeted. These include ensuring that 90% of the countries with endemic RHD have integrated and comprehensive control programmes, as well as the availability of high-quality BPG for 90% of patients with RHD in 90% of countries with a high burden of this disease within 10 years.[14 15]

Multiple choice questions

1. The prevalence of rheumatic fever is?
   - A. the commonest of acquired heart diseases
   - B. 16 million cases worldwide
   - C. the commonest in children from the age of 5 to 11
   - D. all of the above.
2. The major diagnostic criteria (Duckett Jones) include?
   - A. streptococcal infection
   - B. arthritis
   - C. carditis
   - D. first-degree heart block
   - E. erythema toxicum
   - F. chorea.
3. The differential diagnosis of the chorea is?
   - A. toxin ingestion
   - B. viral infection
   - C. systemic lupus erythematosus
   - D. infective endocarditis
   - E. epilepsy.
4. Chronic rheumatic heart disease?
   - A. tends to occur 10–20 years after the acute illness
   - B. is best treated with aspirin
   - C. has a known genetic cause
   - D. most often requires surgery to replace the aortic valve
   - E. can be prevented by long-term penicillin prophylaxis.
5. The World Heart Federation is aiming for?
   - A. 25% reduction in premature deaths from RF and RHD by 2025 in people younger than 25 years of age
   - B. 50% of developing countries with an integrated programme for RF
   - C. a vaccine to prevent RF in the developing world
   - D. a cure to poverty in the next 50 years to prevent GABHS infection
   - E. all of the above.

Answers to the questions are at the end of the references.

4. Perhaps the foremost challenge is to translate what is known and understood into practical measures that can be implemented and sustained in endemic regions. For example, secondary prophylaxis and register-based RHD control programmes are universally accepted as the most cost-effective approach, as demonstrated by the success of such programmes in New Zealand and Australia. The schemes are also endorsed by WHO and WHF but, despite this, national programmes still remain to be established in developing countries.[4]

CONCLUSIONS

ARF and RHD remain a serious public health burden throughout the world. Its presence remains in the UK serving as a reminder that suspected ARF cases should always undergo echocardiographic assessment to identify subclinical valvulitis, to allow appropriate prophylaxis against RHD.[7 16]

Contributors Both authors have contributed equally to the writing of this article.

Competing interests None.

Provenance and peer review Commissioned; externally peer reviewed.

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Answers to the multiple choice questions

1. D
2. B, C, F
3. A, B, C
4. A, E
5. A, C

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Arch Dis Child Educ Pract Ed published online February 4, 2015