Rigors

Description
A rigor is an episode of shaking or exaggerated shivering which can occur with a high fever. It is an extreme reflex response which occurs for a variety of reasons. It should not be ignored, as it is often a marker for significant and sometimes serious infections (most often bacterial). It is important to recognise the patient's description of a rigor, as the episode is unlikely to be witnessed outside hospital, and to be aware of the possible significance of this important symptom.

Pathophysiology
Shivering is a reflex which occurs when someone feels cold and, physiologically, it serves to raise body temperature. The trigger point at which this reflex occurs is set in the anterior hypothalamus. This has been likened to an internal thermostat. With infection or inflammation, pyrogens (probably cytokines and prostaglandins) 'reset' the trigger temperature so that the body feels cold and shaking occurs to raise temperature to the new hypothalamic 'temperature point'. The body's attempts to raise temperature are accompanied by other familiar reflex responses, including contraction of erector pilae muscles ('goose bumps') and peripheral vasoconstriction. Peripheral vasoconstriction causes cold extremities and pallor. Most of the work done on various pyrogens responsible for mediating this response has been done on animals.

Epidemiology
Rigors are a common accompaniment of high fever.

- They occur more commonly in children.\(^2\)
- They are less likely to occur in the elderly.\(^3\)
- However, they are a predictor of bacteraemia and bacterial infection in young and old.\(^4, 5\)

Presentation

History
- The sudden attack of severe shivering accompanied by a feeling of coldness ('the chills') is called a rigor and is associated often with a marked rise in body temperature. It may be described by patients as an attack of uncontrollable shaking.
- A history of rigors should raise suspicion of infection, particularly bacterial infection. Enquiry should be made about:
  - Symptoms suggestive of local infection, particularly respiratory infections, urinary infections, biliary disease, and gastrointestinal (GI) infections.
  - Recent surgical procedures.
  - Any relevant past medical history such as rheumatic heart disease.
  - Recent foreign travel.
  - Medication and allergies.

Examination
- This should be performed according to the history.
- Care should be taken in children where even an otitis media or upper respiratory infection may have triggered a rigor.
- It should be remembered that rigors can be an early symptom in septicaemia, particularly meningococcal septicaemia.\(^6\) Appropriate care should be taken to examine for rashes as well as signs of meningism, especially in children.
- A history of rigors in the night may be followed by signs of a pneumonia the next day.

Differential diagnosis
The classic differential diagnosis for rigors includes:

- Biliary sepsis (part of Charcot's triad).\(^7\)
- Pyelonephritis.
- Visceral abscess (including lung, liver and paracolic).
- Malaria.

It is important in children to differentiate a rigor from a febrile convulsion. In adults care should be taken to differentiate from a fit or convulsion. There is a wide range of conditions that can be associated with rigors, such as:

Cardiac

- Infective endocarditis.
Pericarditis.
Lemierre's syndrome.
Dressler's syndrome.

Pulmonary
- Pneumonia.\cite{8}
- Severe acute respiratory syndrome (SARS).\cite{9,10}

Genitourinary
- Urinary tract infections.
- Pyelonephritis.
- Prostatitis.
- Prostate cancer.\cite{11}

Obstetric\cite{12}
- Over half of parturients experience shaking rigors.
- Epidurals and fever seem to be associated with the rigors

Rheumatological
- Septic arthritis.\cite{13}
- Rheumatic fever.

Infectious diseases
- Meningococcal septicaemia.\cite{6}
- Malaria.\cite{14}
- Rat-bite fever.\cite{15}
- Filariasis.\cite{16}
- Brucellosis.\cite{17,18,19}
- Tuberculosis (miliary).
- Lyme disease.
- Louse-borne relapsing fever (endemic in Ethiopia).

GI
- Gastroenteritis.
- Acute cholangitis.\cite{7}
- Ulcerative colitis.\cite{20}

Drug reactions (usually intravenous)\cite{21}
- Jarisch-Herxheimer reaction.\cite{22}
- Gentamicin.
- Vancomycin.
- Interleukin II.
- Amphotericin.
- Anti-TNF-alpha drugs.

Transfusion reactions
- 30% of transfusion reactions are associated with rigors.\cite{23}
- Many types of blood product transfusions.

Dermatological
- Generalised pustular psoriasis.\cite{24}
- Any severe generalised rash, especially in children.

Iatrogenic
- Haemodialysis.\cite{25}
- After radiotherapy.
- After bone marrow transplant.
- Catheterisation.\cite{3}
- Postoperative infections.
Investigations

This will depend on the clinical assessment and likely cause. Very often history and examination will reveal a source of infection, and treatment can be commenced without extensive investigation. However, in children, extreme care should be taken and hospital admission will usually be indicated, particularly when the child remains febrile and no source of infection is found (the pyrexia of unknown origin (PUO)).

The following list is not exhaustive. In particular, an ill child investigation is likely to include:

- Screening for infection, and basic blood tests:
  - FBC, U&Es, ESR, CRP, and LFTs.
  - Blood cultures.
  - Urine for microscopy and culture.
  - Lumbar puncture and cerebrospinal fluid analysis.

- Imaging:
  - CXR.
  - CT scan.
  - MRI scan.

Management

- Temperature-lowering general measures, particularly in children, are important but antipyretic agents should not routinely be used with the sole aim of reducing the body temperature of a child with fever. However, if they are distressed due to a fever then antipyretics are recommended. [26]
- It is important to find and treat the source of infection.
- It is likely that hospitalisation will be required for diagnosis and treatment if the patient remains unwell and febrile. Admission to hospital is more likely to be required in children and in the elderly.

Further reading & references

26. Fever in under 5s - assessment and initial management; NICE Guideline (updated August 2017)

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