THE NORTHERN HOSPITAL

TYPHOID



Marion Tomas Griffin, as "Typhoid Mary" in "The Most Dangerous Woman in America" 2004.

"I had my first talk with Mary in the kitchen of this house…I was as diplomatic as possible, but I had to say I suspected her of making people sick and that I wanted specimens of her urine, feces and blood. It did not take Mary long to react to this suggestion. She seized a carving fork and advanced in my direction. I passed rapidly down the long narrow hall, though the tall iron Gate…and so to the sidewalk. I felt rather lucky to have escaped…"

George Soper New York City Health Department, 1907.

"She came out fighting and swearing, both of which she could do with appalling efficiency and vigor. I made another effort to talk to her sensibly and asked her again to let me have the specimens, but it was of no use. By that time she was convinced that the law was wantonly persecuting her, when she had done nothing wrong. She knew she had never had typhoid fever, she was maniacal in her integrity. There was nothing I could do but take her with us. The policeman lifted her into the ambulance and I literally sat on her all the way to the hospital, it was like being in a cage with an angry lion"

Dr Sara Josephine Baker, New York City Health Department, 1907.

Mary Mallon's explosive response to a total stranger's request for samples of her faeces, blood and urine and accusation of making people ill, even of killing them, was quite understandable in the context of the times. Mary was the first person in history identified as a healthy carrier of the deadly typhoid. She refused to believe that she was responsible for the fact that a host of people she had cooked for had contracted the fearsome bacteria. Part of this disbelief laid in the fact that she had never had typhoid and that she had remained perfectly healthy her whole life. The health worker George Soper had done his homework thoroughly enough, though his handling of Mary certainly left a lot to be desired and it is no wonder he felt grateful to have escaped his first meeting with her with his life intact. By careful enquiry he discovered that wherever Mary had worked as a cook she had left a trail of typhoid in her wake, about 50 cases and 3 deaths had been recorded over a number of households she had worked at. Although a significant number, it was in fact a far cry from the supposed thousands she had infected and killed in the minds of hysterical New Yorkers of the day who had cruelly labelled her "Typhoid Mary"

Following the frantic retreat of Mr Soper, another public health worker Doctor Sara Josephine Baker accompanied this time by the New York City Police, had Mary arrested and forcibly held at the Riverside Hospital for Communicable Diseases on the remote North Brother Island that overlooked the Bronx region of Manhattan. She was kept there for no less than 3 years and was only released in 1910 following help from her lawyers and a promise by sworn affidavit that she would never work as a cook again. Life however for a single female domestic was very tough and of all domestic jobs it was cooking that paid the best and it was cooking that she was particularly good at. Her peach ice-creams in particular were famous, but unfortunately these also proved to be an efficient transmitter of the typhoid she carried, as it was an uncooked food. Still unwilling to believe she could be carrying the deadly bacteria and further believing that she was being unfairly persecuted because she was an Irish catholic, she resumed work as a cook at the Sloan Hospital for Women in Manhattan under the assumed name of Mary Brown. Twenty five cases of typhoid promptly followed including two deaths. Mary was soon discovered, re-arrested and reimprisoned on North Brother Island, this time for 25 years! She died there in1938.

The harshness and severity of Mary Mallon's treatment can be better understood in the context of 1907. Typhoid can be fatal and in 1907 there was no treatment. Although Mary was attractive, tall and blued eyed she was also a poor Irish catholic immigrant, unmarried female with a fearful Irish temper and a "determined mouth and jaw". Born in Cooktown Ireland in 1869 she was one of the millions of poor Irish Catholics that emigrated to New York city in the generation that followed the "Great Hunger" of the potato famine of 1845 that saw Ireland's population of 8 million plummet to about half this in the space of a single generation. This Irish Catholic influx was a source of scorn for the rich protestant ruling classes of the New York of the day. Although extremely hot tempered and stubborn she had to be to survive in an age of religious prejudice and bigotry and with out any form of social security. Other carriers were not treated nearly so harshly. She was an intelligent woman, well read especially in the works of Charles Dickens whom she felt shared her affinity for the poor and oppressed. Whenever people, especially children, became ill she was the first to look after them with tireless dedication. Perhaps a more gentle sympathetic approach and continued education instead of brutal persecution would have resulted in a happier life for this sad and tragic but fundamentally decent woman.

TYPHOID

Introduction

Typhoid and the less virulent paratyphoid, are **systemic septicemic** diseases, though GIT symptoms are prominent.

They have an enteric portal of entry, hence are often referred to as the "enteric" fevers.

Almost all typhoid and paratyphoid fevers are acquired outside Australia [2] in third world countries where sanitary conditions are poor **and hence a history of returned travellers with fever will be an important factor in the clinical assessment of these patients.**

Untreated, typhoid has significant mortality.

Pathophysiology

Organism

- Salmonella typhi, the gram-negative typhoid bacillus.
- Salmonella paratyphi, with three recognised serovars A, B and C

Complications

1. Death may occur from:
    - GIT fluid loss.
    - Septic shock.
    - GIT perforation.
    - GIT hemorrhage.
2. Relapse:
    - Relapse of typhoid fever after clinical cure is not uncommon even in immunologically normal individuals.
3. Chronic carriage:
    - Chronic carriage of salmonellae is defined as excretion of the organism in the stool for more than 12 months after the acute infection.
    - Rates of chronic carriage after S. typhi infection range from 1 to 6 percent, and are higher in patients with cholelithiasis or other biliary tract disease.

- Chronic carriers do not develop recurrent symptomatic disease. They are chronically colonized, and may excrete large numbers of organisms, however have high levels of systemic immunity and do not develop clinical disease.

- Chronic carriers represent an infectious risk to others however, particularly if involved in food preparation. For this reason, eradication of carriage is usually attempted once such individuals are identified.

Factors Affecting the Severity of Illness

These include: [4]

- The duration of illness, before the commencement of appropriate antibiotics.

- The patients age, (illness is more severe in those less than 5 years and in the elderly).

- Previous exposure or vaccination history.

- The virulence of the bacterial strain.

- The quantity of inoculum ingested.

- Host immunological factors, (eg HIV)

Transmission

- Salmonella is transmitted by contaminated water and food and rarely by direct contact.

- Water, ice (if unboiled water used), raw vegetables, salads and shellfish are important sources for travellers.

- The disease commonly occurs in association with poor standards of hygiene in food preparation and handling.

Incubation Period

- Typhoid fever is usually 8–14 days but this depends on the infective dose and can vary from three days to one month.

- Paratyphoid fever is usually one to ten days.

Reservoir

Typhoid fever:

- Human *gallbladder* carriers

- Rarely human urinary carriers

Paratyphoid fever:

- Humans
- Rarely domestic animals.

Period of communicability

- Typhoid or paratyphoid are communicable so long as bacilli are present in excreta.
- **Some patients become chronic carriers.**

Susceptibility & resistance

- Everyone is susceptible to infection.
- Immunity following clinical disease or immunisation is insufficient to protect against a large infectious dose of organisms.

Clinical Features

It is essential to ask about recent travel and where this occurred.

Clinical features of typhoid include:

1. **Fever, often without any obvious focus.**
2. Tachycardia may be present but a relative bradycardia is also classically described.
3. Constitutional symptoms:

   Non-specific "constitutional" symptoms are prominent and may include:

   - Headache
   - Myalgias
   - Arthralgias
   - Lethargy/ malaise
4. GIT:

- There is often a transient GIT syndrome with anorexia nausea, vomiting and diarrhoea, before the full clinical syndrome develops.

- Constipation may also be seen, (possibly due to obstruction at the ileocecal valve by swollen Peyer patches).

5. Rose spots:

   The classically described "rose spots" are probably embolic phenomena.

   - They are salmon colored sparse (often less than 5 lesions) blanching maculopapular spots on the trunk.

   - They are non-diagnostic and their absence does not rule out typhoid.

6. Over the second and third weeks of illness the patient becomes progressively more unwell. Other systemic features may occur at this stage:

   - Delirium

   - Increasing abdominal distension and fluid loss

   - Splenomegaly

   - Rarely cardiac symptoms, meningitis, pancreatitis, respiratory symptoms and osteomyelitis.

7. Death may occur from:

   - GIT fluid loss

   - Septic shock.

   - GIT perforation

   - GIT hemorrhage.

The classically described time course of the illness is divided into 3 phases, the first week being characterized by fevers and constitutional symptoms, the second by abdominal symptoms and the third week by lethal abdominal complications. It should be noted however that in practice this can be extremely variable.

In the absence of acute complications, or death from overwhelming sepsis, resolution is protracted occurring over a period of **weeks to months**.

Mortality rates were around 15 % or greater in the pre-antibiotic era.

Paratyphoid fever presents a similar clinical picture but is usually milder, shorter in duration and has fewer complications.

Investigations

Diagnosis is made by culture of typhoid or paratyphoid bacilli from the blood, urine or faeces.

Repeated sampling may be necessary.

Blood tests

1. FBE
    - Anemia may be seen
    - Leukopenia or leukocytosis may be seen.
2. CRP
    - Will be elevated.
3. U&Es/ glucose
4. LFTs
    - May be elevated.
5. **Blood cultures**

Others as clinically indicated

CXR/AXR

These are not routinely helpful, unless:

- Other abdominal conditions such as obstruction need to be ruled out.
- Perforated GIT is suspected.

Microbiology

- **Urine for micro and culture.**
- **Fecal micro and culture.**

Bone marrow aspirate and culture. [4]

- When the above cultures are negative, another possible source of diagnostic culture material is the bone marrow. Although these are more sensitive, the procedure is much more invasive.

- This test may be considered in complicated cases or when antimicrobial therapy has already been initiated and the diagnosis remains in doubt.

PCR

- There is no current *specific* PCR test for Salmonella typhi, however there is a PCR test for the **invA gene** that is common to all invasive salmonella organisms in general. This may therefore assist in the identification of an invasive salmonella organism without making a definitive diagnosis of S. typhi.

Serology

- Serology in the form of the older "Widal" test is **no longer routinely used**. It measured agglutinating antibodies against H and O antigens of *S typhi*.

- It produces false-negative results in a significant proportion of patients who do not mount a detectable antibody response.

- It also produces false positive results. It is highly non-specific, especially in endemic areas where cross-reacting antigens from similar organisms are common or previous typhoid infection or vaccination has occurred.

Management

1. Initial management will be directed to fluid and electrolyte resuscitation.

    - Give initial fluid bolus and ongoing fluids as clinically indicted.

2. Antibiotics [2]

    Reduced susceptibility to fluoroquinolones is common in infections acquired in the Indian subcontinent and Vietnam.

    Initial empiric choices include:

    - Ciprofloxacin, orally or IV if unwell.
    - **IV ceftriaxone**
    - IV azithromycin.

    For full dosing regimes and other options see latest Antibiotic Guidelines.

Disposition

- **Any patient suspected of having typhoid fever should be admitted.**

- Suspected cases should be discussed with the infectious diseases consultant.

Follow-up

- Patients need to be followed up by an infectious disease specialist to ensure that they have not become a long-term carrier.
- Long-term carriers will need to have eradication antibiotics.
- Cholecystectomy may be considered.

Vaccination

Vaccination is not routinely recommended.

It should be offered for:

- Travellers who will be exposed to potentially contaminated food and water in countries such as in Asia, the Middle East, Africa, Latin America and the Pacific Islands.
- Laboratory workers in potential contact with Salmonella typhi.

Vaccine types:

- Three typhoid vaccines are currently available in Australia.
- The live oral vaccine and Vi capsular polysaccharide injectable vaccine generally cause few adverse reactions.
- A combination hepatitis A and typhoid injectable vaccine is also available.
- All formulations are equally effective, and none provide complete protection.
- Vaccination does not offer full protection from infection and travellers should be advised to exercise care in selecting food and drink.
- No vaccine is available against paratyphoid fever.
- **For full vaccination prescribing details, see latest edition of "The Australian Immunization Handbook"** [3]

Notification

- Salmonella (Group A disease) must be notified immediately by telephone **(1300 651 160)** followed by **online** or written notification within five days.
- The Department will also arrange for the collection and testing of weekly faecal specimens for S. typhi or S. paratyphi to be taken over three consecutive weeks,

commencing no sooner than at least 48 hours after cessation of antibiotic treatment.

- They can also follow-up up any close contacts

School exclusion

- Exclude until approved to return by the Department of Human Services.

Work exclusion

- Exclusions apply to food-handlers and some health care workers (see Blue Book for further details). In particular if the patient is a food-handler or works in a profession that poses a high risk of transferring infection to others, such as health care workers, or child care workers, they should be advised to cease work until advised by the Department of Human Services.

References

1. The Blue Book, Website.

2. Therapeutic Antibiotic Guidelines 13th ed 2006

3. The Australian Immunisation Handbook, 9th ed 2008.

4. Bhutta Z. Current concepts in the diagnosis and treatment of typhoid fever. BMJ volume 333 8 July 2006, p. 78-82.

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