Fever in the Post-operative Patient:

A Chilling Problem

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Andy's Pain

Andy, 72, presents to the emergency department with abdominal pain, nausea, and vomiting. A small bowel obstruction is confirmed by laparotomy. On the second post-operative day, he develops pain in and around the incision, associated generalized malaise, and a fever of 38.8 C. Figure 1 demonstrates his abdomen at the time the fever was detected. He is diagnosed with a superficial wound infection and empiric antibiotic therapy is started. *Staphylococcus aureus* is recovered from the wound.

For a followup on Andy, go to page 97.

Angela's Recovery

Angela, 67, is recovering uneventfully in hospital from a bladder suspension procedure. On the third post-operative day, she develops a sudden fever of 39.4 C with violent vigors. She has associated sweats and generalized malaise. A septic workup, consisting of a full history and physical examination, reveals discomfort in the left antecubital fossa where a large bore intravenous catheter had been placed during the surgery. Upon further inspection, it is possible to milk pus from the catheter insertion site (Figures 2a and 2b). Subsequent blood and urine cultures yielded *Staphylococcus aureus*.

For a followup on Angela, go to page 97.

Fever may be present in the post-operative period for both infectious and non-infectious reasons. It is important not to overlook the non-infectious causes when a fever is present, as the cause may be quite benign, or may be indicative of a serious underlying process. Neoplasms or collagen vascular diseases account for many underlying fevers. An infectious process is present in less than half of febrile post-operative patients.[1] General causes of fever in the post-operative period can be classified in three categories (Table 1).

In the first 24 hours after an operation, 27-58% of patients may develop fever.

What are the common causes?

The classic "5W" mnemonic for remembering the causes of fever in the post-operative period is **W**ind, **W**ater, **W**ound, **W**eins/Wings, and **W**onder Drugs. These five causes are also time-dependent and are likely to occur in a relatively predictable sequence (Table 2).

Table1
Infectious and non-infectious causes of fever in the post-operative patient

Infectious—Surgery

- Wound infection
- Intra-abdominal abscess
- Leaking anastomosis with peritonitis
- Infected prosthetic material
- Acute cholecystitis
- Transfusion-related infection
- Pheochromocytoma

Infectious—Not Surgery Related

- Pneumonia
- Urinary tract infection
- Infected hematoma
- Systemic bacteremia
- Clostridium difficile enterocolotis
- Pharyngitis

Related—non-infectious

- Atelectasis
- Medications (anesthesia or other)
- Thrombophlebitis
- Adrenal insufficiency
- Drug fever
- Malignancy
- Pulmonary embolus
- Deep vein thrombosis
- Myocardial infarction
- Thyrotoxicosis

Doris' Discomfort

Doris, 63, presents feeling generally unwell. A diffuse abdominal discomfort was corroborated by her daughter, who noted her mother had complained of left flank pain and urinary hesitancy, urgency, and dysuria. A more extensive history revealed that approximately one week prior, the patient had been discharged from hospital after having undergone an open cholecystectomy, which was originally planned to be completed laparoscopically.

The abdominal examination was unremarkable and left flank tenderness was present on percussion. A urine specimen was obtained, which was turbid, and the urine dipstick indicated many leukocytes and nitrates. An empiric diagnosis of a urinary tract infection (UTI) was made and oral antibiotics initiated. Urine cultures returned *Escherichia coli* to a concentration of greater than 10^8 cfu/L.

For more on Doris, go to page 97.

Wind

In the first 24 hours after an operation, 27% to 58% of patients may develop fever. Most of these cases, which are likely due to atelectasis, are of little concern unless associated with systemic signs, such as rigors, altered mentation, or hypotension. Pneumonia may occur several days post-surgery and is an important diagnosis to consider if systemic signs are present; it is also important to question the presence of a ventilator-associated pneumonia after prolonged intubation.

Water

The patient has an increased risk of developing cystitis the longer a urethral catheter is in place. The catheter should be removed as soon as the patient is able to mobilize, or use a urinal.

Wound

It is important not to miss something nefarious, like a necrotizing fasciitis or an intestinal leak, especially post-surgery. A cellulitis may be present

Table2
Causes of fever according to time of onset

Day One—Local causes

- Atelectasis
- Wound cellulitis
- Urinary tract infection
- Indwelling catheter infection
- Transfusion reaction
- Drug fever
- Thrombophlebitis
- Surgical complications

Day Two—Respiratory/Catheter causes

- Pneumonia
- Urinary tract infection
- Wound cellulitis
- Necrotizing fasciitis or clostridial myositis

Day Three—Systemic causes

- Thrombophlebitis
- Deep vein thrombosis
- Wound infection
- Cholecystitis
- Pancreatitis
- Systemic bacteremia/fungemia/viremia

Day Seven and on—Surgical complications, undiagnosed disease

- Leaking anastomosis
- Infected prosthetic material
- Deep wound infection
- Abscess
- Deep vein thrombosis or thrombophlebitis
- *Clostridium difficile* diarrhea
- Collagen/Vascular disease
- Occult bacteremia
- Neoplasm

in the early stages of post-surgery and an abscess may evolve. In late stages, prosthetic material may be infected and present itself as a fever. Leaking anastomosis, from gastrointestinal procedures, may also be present later on.

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Weins/Wings

Veins, extremeties and all vascular access sites should be inspected for the presence of thrombophlebitis. Likewise, it is important to consider a deep vein thrombosis in a patient who has been immobilized, or has another reason to be in a hypercoagulable state.

Wonder drugs

Always consider the patient's previous medications, as well as those received intra-operatively, as possible causes of fever. Any transfusion products or anti-inflammatory agents can be included in this category.[2]

Figure 1. Abdominal wall cellulites in our patient.

Figure 2a. Medial to the intravenous catheter is a superficial collection of pus, which was expressed from the underlying septic vein.

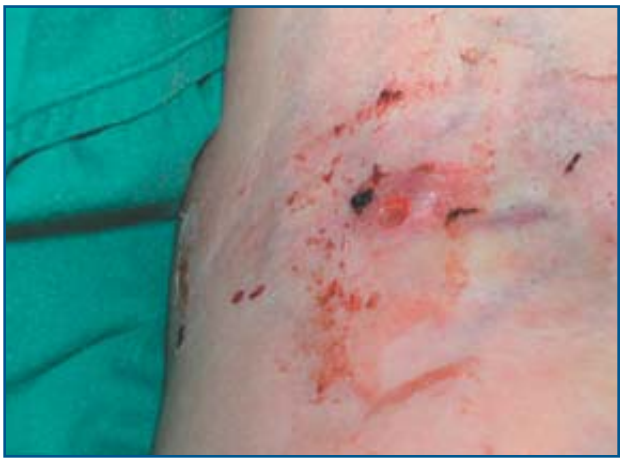

Figure 2b. Once this site is cleaned, a large opening of the septic underlying vein can be observed.

Evaluating a patient with post-operative fever

It is important to elicit the timeline associated with the fever. Key questions to ask are:

- When was the surgery?
- What type of procedure was performed?
- Are there pre-existing or implanted prostheses involved?
- What and when was peri-operative antibiotic prophylaxis given?
- When did symptoms begin?
- Were any symptoms present prior to surgery?
- Were there any complications with the surgery, or a prolonged hospital stay?
- Does the patient have pre-existing medical conditions that could predispose to fever?
- Were there blood products given?

A thorough review of systems, including respiratory, genitourinary, gastrointestinal, neurologic, and cardiac is necessary. Physical examination should include the respiratory, cardiovascular, urinary, and gastrointestinal systems, as well as a thorough examination of the skin. An examination of the peripheral or central sites that were used for vascular access is also important, as an infected hematoma or thrombophlebitic vein may be present.

Lastly, a thorough inspection of the wound site is imperative.

- Is there a fluctuant mass palpable?
- Is redness or heat present surrounding the incision?
- Is there a surrounding wound cellulitis that may or may not be well demarcated?
- Is pain present?

Andy's Followup

Andy presented with a superficial skin and soft tissue infection arising directly from the incision site. It is possible that micro-organisms present on the skin at the time the original incision was made were inoculated into the surgical site. This patient received several days of parenteral antimicrobial therapy and was then discharged home on oral antibiotics with a complete resolution of his infection.

Revisiting Angela

Angela presented with *S. aureus* bacteremia arising from the insertion of the intravenous cannula required for administering the anesthetic. *S. aureus* bacteremia is a serious occurrence and cannot be ignored. It can lead to metastatic foci of infection, such as osteomyelitis, septic joints, and endocarditis. The standard management procedure involves the removal of the endovascular device and two weeks of parenteral therapy. Angela's hospitalization was significantly complicated by the *S. aureus* bacteremia, which was eventually cleared after two weeks of cloxacillin treatment.

- Does the implanted joint have full range of motion?

It is important to always consider a latent infection in neurosurgical, orthopedic, and cardiac procedures. A thorough review of the patient's medications is prudent, as it is important not to overlook a "drug fever" associated with the commencement of a new medication. Antibiotics themselves may lead to drug fevers and should not be started unless absolutely necessary. It is also important to remember that antibiotics may cause *Clostridium difficile*-associated disease, which may manifest with fever, abdominal pain, and diarrhea.

Applicable laboratory tests are outlined in Table 3. An abdominal computed axial tomographic scan may be of benefit if abdominal surgery or an intra-abdominal process is anticipated. Nuclear medicine scans may help in detecting local inflammatory processes; however, prior to their request, it

Returning to Doris

Doris presented with a UTI likely from the urinary catheter inserted during surgery. *E. coli* was recovered from her urine and an ultrasound of her kidneys revealed findings compatible with pyelonephritis on the left side. Since she was clinically stable, she was provided oral ciprofloxacin and had an uneventful recovery.

Table 3
Applicable laboratory tests

- Urinalysis
- Complete blood count with differential and peripheral smear
- Erythrocyte sedimentation rate
- Blood cultures
- Radiographic imaging

may be prudent to discuss the scan's role in the management of the patient.[3]

What treatments are available?

Treatments for the post-operative fever are all dependent on the etiology. Thus, identifying the likely cause through a thorough patient history and physical examination becomes critical. Atelectasis will improve with time, although incentive spirometer may speed the process. Removing the offending invasive device and treating the infection with appropriate antibiotics solves catheter-related infections. Thrombophlebitis can often be treated with warm compresses and anti-inflammatory agents, however, if signs and symptoms of infection are present, appropriate antibiotics must be used. CME

References
1. Howard RJ: Finding the cause of postoperative fever. Postgraduate Medicine 1989; 85:223-38.
2. Kamal A, Kauffman CA: Fever of unknown origin. Prograduate Medicine 2003; 114:69-76.
3. Mourad O, Palda V, Detsky AS: A comprehensive evidence-based approach to fever of unknown origin. Arch Intern Med 2003; 163:545-551.

Take-home message

- Fever can appear for both infectious and non-infectious reasons after an operation.
- In the first 24 hours after operation, 27% to 58% of patients may develop fever.
- Physical examination should include the respiratory, cardiovascular, urinary, and gastrointestinal systems, as well as an examination of the skin.
- Thrombophlebitis can often be treated with warm compresses and anti-inflammatory agents.