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Clostridium welchii bacteraemia:
A case report with survival and review of the literature

MELVIN YUDIS
M.D.
N.I.H. Post-Doctoral Fellow

STANLEY ZUCKER
M.D.
Resident in Internal Medicine

Department of Medicine, Hahnemann Hospital,
Philadelphia, Pennsylvania

The following case report concerns an elderly woman in whom Clostridium welchii bacteraemia developed after a cholecystectomy. Though uncommon, clostridial bacteraemia is a serious and often forgotten complication following biliary tract surgery. It emphasizes the need for the early diagnosis and treatment of this potentially lethal infection. The differentiation between the Gram-positive clostridial bacteraemia and the more commonly occurring Gram-negative bacteraemias is stressed.

Case report

B.O., an 80-year-old housewife, was admitted to the Medical Service of Hahnemann Hospital because of severe upper abdominal pain of 7 hr duration. She had previously been in good health except for a history of intolerance to fatty foods. On the evening prior to admission the patient became nauseated while eating a light supper. The nausea was followed by a constant, non-radiating epigastric pain.

Examination revealed an elderly, well-oriented white woman in acute distress, complaining of abdominal pain. Blood pressure was 170/115 mmHg. Respirations were 24/min, pulse was 100 beats/min and the oral temperature was 97.4°F. The skin was warm and dry; there were no eruptions, jaundice or ecchymosis. Neither rebound tenderness nor rigidity was present. A tender 4-cm globular mass, which could be delineated from the overlying liver, was palpated below the right costal margin. Bowel sounds were hypoactive.

The haemoglobin was 13.6 g/100 ml, haematocrit 45%, WBC 18,000, differential 87% segmented neutrophils, one eosinophil, ten lymphocytes and two monocytes. A flat plate of the abdomen showed a normal gas pattern with no evidence of calculi in the region of the gall-bladder.

A diagnosis of acute cholecystitis was made and the patient was scheduled for operation as soon as the acute inflammatory process could be controlled. Eighteen hours after admission the temperature rose to 101°F rectally and rebound tenderness was elicited in the right upper quadrant. A diagnosis of cholecystitis with perforation was made and arrangements for immediate operation were planned.

A cholecystectomy and appendectomy were performed. The gall-bladder was found to be distended and haemorrhagic, with focal areas of gangrenous serosa. An operative cholangiogram revealed a radiolucent area in the distal common bile duct. Exploration of the common bile duct revealed a calculus which was removed.

Post-operatively, the patient was placed on a regimen of tetracycline, 200 mg intramuscularly every 6 hr, intravenous fluids, nasogastric suction and Foley catheter drainage. On the 2nd post-operative day a black-coloured Haematest-positive material was noted to drain from the nasogastric tube. The patient complained of colicky lower abdominal pains and appeared restless and tachypneic. The pulse was 120 beats/min, the blood pressure was 170/110 mmHg and the oral temperature was 101°F. Tenderness to palpation, guarding and rebound tenderness were present in the right upper quadrant, especially around the sutures. The urine was noted to be slightly red in colour. Several hours later the blood pressure dropped to 110/75, and the patient's skin was noted to be cool and moist, with a violaceous mottling over the lower extremities. A diagnosis of Gram-negative bacteraemia was entertained. The patient was started on a course of parenteral antibiotics; chloramphenicol 3 g, penicillin 7.5 million units, hydrocortisone 300 mg i.v. daily as well as streptomycin 2 g i.m. daily.
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On the morning of the 3rd post-operative day, the patient was noted to be profoundly icteric. When she was sitting, her blood pressure fell to a recorded level of 80/60 mmHg. Total bilirubin was 20 mg/100 ml with 1 min of 9-7 mg, leucocytes 23,317/mm² with 80% segmented neutrophiles and thirteen bands. Haemoglobin and haematocrit dropped to 9-8 g/100 ml and 32%, respectively. The next day the patient was noted to be more restless, disoriented and delirious. Blood urea nitrogen rose to 35 mg/100 ml, lactic acid dehydrogenase was 1480, serum glutamic pyruvic transaminase was 76. The post-operative blood culture grew Clostridium welchii.

Re-operation was considered for the purpose of debriding the gall-bladder bed, which was felt to be the focus of the clostridial infection. However, the patient seemed slightly improved on medical therapy and was a very poor operative risk. Therefore, further trial of medical therapy seemed warranted. The hydrocortisone was discontinued and the penicillin increased to 60 million units daily intravenously. Eight vials of polyvalent gas gangrene antiserum and 3 units of blood were given over the next 2 days. Urine output was 1000 ml daily; no free haemoglobin was present in the urine. By the 6th post-operative day, the patient appeared oriented and rational. Her oral temperature was 100°F. Bilirubin was 2-7 total and 1-5 direct 1 min, and the blood urea nitrogen returned to normal levels of 13 mg/100 ml.

Culture material taken from the penrose drain removed from the subhepatic fossa 5 days after operation revealed Clostridium welchii sensitive to penicillin, streptomycin and chloramphenicol. The convalescent period was unremarkable. The patient was discharged approximately 5½ weeks after her cholecystectomy.

Four months later the patient was in fair health and was asymptomatic.

Discussion

Classically, when clostridial bacteraemia occurs following cholecystectomy, the symptoms and signs appear within 6-12 hr. The onset of the complication is marked by a slow, steady fall in blood pressure, acceleration of pulse, and rise in temperature (Pyttek & Bartus, 1962). The patient appears restless, anxious, listless and weak, and perspires freely. The skin is cold, moist and of a peculiar grey colour. The abdomen appears tender and distended. A burgundy colour of the urine and plasma indicates haemoglobinuria and haemoglobinemia, which may progress to anuria, anaemia, spherocytosis and jaundice (Bennett & Healy, 1963). A frequent finding is leukopenia or leukocytosis with a marked increase in the percentage of immature neutrophils, and occasionally haemorrhagic diathesis and haematemesis are present (Brown & Milch, 1948). Frequently extreme tenderness, crepitation, purplish discoloration and drainage of serosanguinous exudate may be noted at the wound area. Ultimately, if the infection is untreated, or cannot be controlled, delirium intervenes and proceeds to coma and death. Intensive shock therapy with vasopressors and fluids results in no significant improvement.

Elliott-Smith & Ellis (1957) state that when collapse and toxaemia follow rapidly after cholecystectomy, a gas bacillus infection should be strongly suspected. Early recognition of this type of infection is the most important feature in therapy. Pyttek & Bartus (1962), realizing the indispensibility of early diagnosis in the management of infection after biliary tract surgery, adopted the policy of culturing the bile at the time of surgery. Turner (1964) stated that Clostridium welchii bacteraemia may follow such a fulminating course that treatment must be started before reports of positive cultures are available. He also advises that stained smears of material from the gall-bladder and common duct be examined for Gram-positive bacilli postoperatively in order to provide a more immediate guide for treatment than cultures. Cultures should be taken from the gall-bladder wall as well as the bile, since the yield of positives is four times as great with material from the wall.

Ryan, Harrigan & Penny (1953) advised routine chemotherapy after cholecystectomy because of the invariable presence of anaerobic bacilli in the bile. Pyttek & Bartus feel that the delay while awaiting positive blood cultures will allow Clostridia to overwhelm the host. This threat may be aborted by prophylactic antibiotic therapy in the immediate post-operative period for patients who had empyema of the gall-bladder, jaundice with common duct obstruction, gross spillage of bile or gangrenous cholecystitis. Wilson & Mills (1964), on the contrary, do not believe that the very small risk of clostridial infection justifies routine chemotherapy after cholecystectomy. We agree with the latter authors and feel that chemotherapy should not be given routinely unless clinical signs suggesting infection by Gram-positive rods are seen in the Gram stain from the gall-bladder wall or bile.

Antibiotics have a definite role in the treatment of clostridial bacteraemia, but only an auxiliary one in gas gangrene (Burnstein et al., 1964). Pyttek & Bartus (1962) recommend penicillin, 20 million units per day intravenously. Eveland et al. (1955), using a tube-dilution in vitro method of testing antibiotics against 103 strains of
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*Clostridium welchii*, showed a definite order of activity among the drugs. Chlorotetracycline was most effective and chloramphenicol was least effective. Penicillin fell in between these extremes, depending on the strain tested.

Most workers feel that though its efficacy is not yet proven, polyvalent gas-gangrene antitoxin in sufficient dosage should not be denied the patient. Taylor (1954) suggested using polyvalent antitoxin in doses of four vials intravenously, immediately followed by two vials every 6 hr (each vial contains 10,000 units of *Clostridium welchii*, 10,000 units of *septicum*, 300 units of *histolyticum*, 500 units of *novyi*, and 1500 units of *difertans*). When the patient improves the dose is tapered to one vial every 6 hr. Whole blood and plasma in large amounts as necessary, as well as intensive supportive care, are indispensable. Debridement of the infected site is also essential in many cases of post-operative clostridial bacteraemia. Brummelkamp, Boerema & Hoogendyke (1963) found hyperbaric oxygen drenching to be effective in clostridial bacteraemia when conventional treatment was ineffective. The use of oxygen in clostridial bacteraemia when conventional treatment of the causal organism. Breathing pure oxygen in a hyperbaric chamber at three atmospheres increases the alveolar oxygen tension fifteen times and the tissue oxygen content tension is, likewise, increased. This arrests the progress of anaerobic infection. However, the side effects of the hyperbaric chamber, including intractable earache and oxygen intoxication, must be considered. Hanson *et al.* (1966) also reported on this form of therapy.

The Gram-positive *Clostridium welchii* bacteraemia is a serious fulminating complication of biliary tract surgery and may mimic in many ways a Gram-negative bacteraemia. Both entities may present post-operatively with chills, fever, hypotension, mental confusion, vomiting, jaundice and leukocytosis. Elderly patients with acute cholecystitis, empyema of the gall-bladder or common duct stones frequently have indwelling Foley catheters placed either pre- or post-operatively. Urethral catheterizations and other types of urologic manipulation are common precipitating events in Gram-negative bacteraemia (Weinstein & Klainer, 1966).

In hypotension due to Gram-negative bacteraemia, the expected findings of tachycardia and cold clammy moist skin may be absent. Instead, dry warm skin and bradycardia are often seen, especially in elderly patients. In the hypotension associated with clostridial bacteraemia, marked apprehension, anxiety, restlessness, tachycardia and profuse perspiration are more often noted. Jaundice, when seen in Gram-negative bacteraemia is probably a reflection of underlying hepatic disease due to alcoholism and Laennec's cirrhosis (Weil, Shubin & Biddle, 1964). Jaundice in clostridial bacteraemia, however, is primarily the result of a haemolytic process.

**Summary**

*Clostridium welchii* bacteraemia is a serious and potentially fatal complication following cholecystectomy. The differentiation of this condition from the more commonly occurring Gram-negative bacteraemia may prove quite difficult. Since the therapy for each differs, early diagnosis is essential.

Routine Gram stain and culture of the gall-bladder wall at surgery would be most helpful in alerting the clinician to the formidable complication of clostridial bacteraemia. This entity is best treated with large doses of penicillin and intravenous fluids. The use of polyvalent gas-gangrene antitoxin and hyperbaric oxygen may also be indicated. Surgical debridement of the site of infection will be essential in many instances.

**References**


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