ST-Segment Elevation in Acute Cholecystitis with Uncontrolled Hyperthyroidism

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Abstract

Synopsis: A variety of non-cardiac conditions have been reported to present with ischemic heart disease clinically and electrocardiographically like cholecystitis which leads to nonspecific T-wave inversions or ST-segment depressions, rarely it leads to ST-segment elevation.

Clinical Presentation: We report a case of a 58-year-old, male, hypertensive, diabetic, and with hyperthyroidism on medication. Patient presents with two weeks history of epigastric pain associated with nausea and vomiting. Symptoms spontaneously resolved until one day prior to admission patient developed persistent abdominal pain. Patient was seen at a local hospital wherein work-up was done which showed leukocytosis on CBC, hydrops of gallbladder on ultrasound. Further work-up were anteroseptal wall ST elevation on ECG with negative cardiac enzymes. Patient was advised transfer to our institution.

Physical Findings: Pertinent Physical exam includes tachycardia, epigastric tenderness and positive Murphy's sign. During the course, patient developed fever and jaundice.

Laboratory Work-up: Repeat CBC still showed leukocytosis with neutrophilia. Repeat electrocardiogram showed anteroseptal wall ST elevation with negative Troponin. Echocardiogram showed adequate ejection fraction and adequate wall motion contractility. Thyroid function test showed increased FT4 and decreased TSH.

Treatment: Patient was initially started with acute coronary syndrome regimen. Antibiotics were initiated and anti-thyroid and anti-diabetes drugs were adjusted accordingly. There was noted progressive abdominal pain; hence, patient was referred to surgery. Patient was cardio-pulmonary and endocrinologically prepared and cleared for the procedure. Patient tolerated the procedure.

Outcome: Patient was discharged improved with noted improvement of the electrocardiogram.

Keywords: Cholecystitis, ST-segment elevation, impending thyroid storm, cholecystectomy

Introduction

A variety of noncardiac conditions have been reported to mimic ischemic heart disease both clinically and with ECG changes. Some of these include cholecystitis, pancreatitis, and pneumonitis. Usually these conditions lead to diffuse ECG changes, such as nonspecific T-wave inversions or ST-segment depressions. Although chest pain with ST-segment elevation frequently indicates cardiac ischemia, it has also been reported with gastric distension, acute cholecystitis, pericarditits, neoplastic invasion of the myocardium, acute cor pulmonale, and hypothermia. Awareness of these differentials is crucial to ensuring appropriate diagnostic investigations, and early confirmation of the alternative diagnoses.[1]

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Case

This is a case of a 58-year-old male, married, Filipino, known hypertensive hyperthyroid and diabetic who was admitted due to a two weeks history of epigastric pain, burning, non-radiating with a pain score of 2/10 precipitated by caffeine intake, associated with nausea and one episode of vomiting. There was no medication taken, nor any consult was done. Symptoms spontaneously resolved until one day prior to admission, the patient developed persistent abdominal pain. Patient was seen at a local hospital wherein work-up was done which showed leukocytosis (16,900) with neutrophilic predominance (90%) on CBC, hydrops of gallbladder on ultrasound. Further work-up were anteroseptal wall ST elevation on ECG with negative cardiac enzymes. Patient was advised transfer to our institution.

Patient is a known hypertensive and hyperthyroid for 10 years and diabetic for five years who was maintained on felodipine 5.0 mg/ tab OD, methimazole 20 mg/tab BID and glimepiride + metformin 5/500 mg/tab BID. No previous surgery. He had a family history of hypertension and diabetes

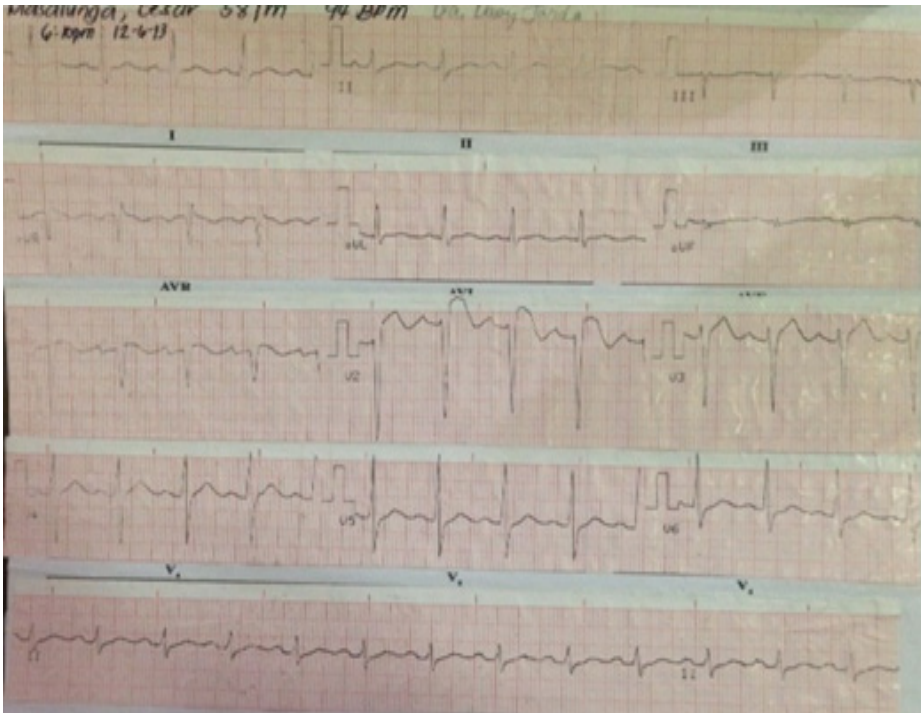

Figure 1. Anteroseptal wall ST-segment elevation

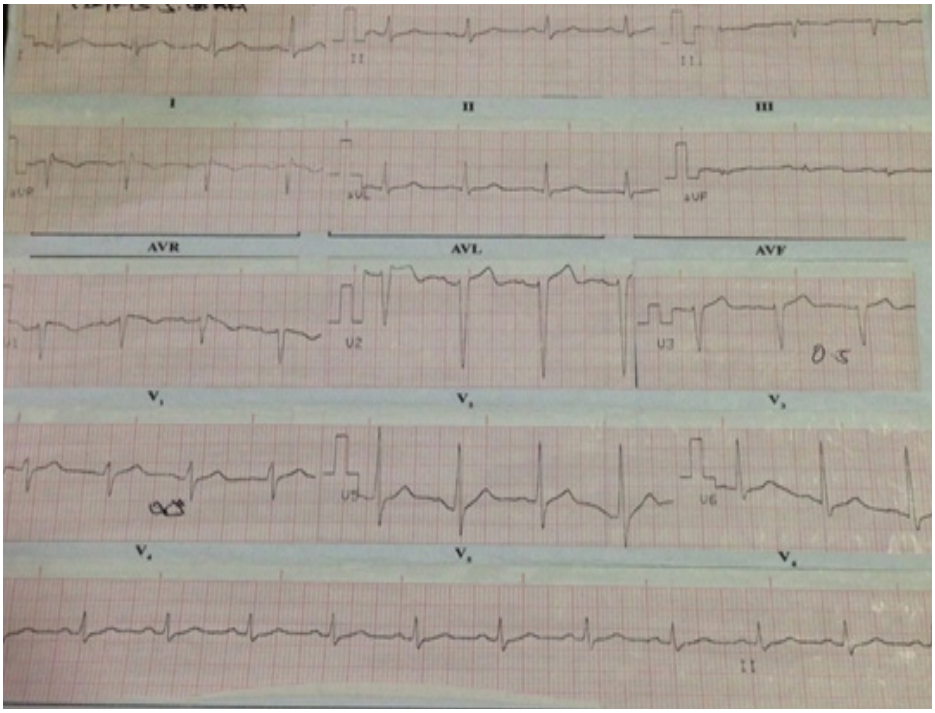

Figure 2. Resolution of Anteroseptal wall ST-segment elevation

on both sides. He is a non smoker and an occasional alcoholic beverage drinker.

Physical examination showed a BP of 150/90, tachycardia at 110 bpm with a BMI of 24.9kg/m2, palpable non-tender non-movable 1x1cm mass on the anterior neck area, (+) Murphy's sign and epigastric tenderness. There was no jaundice and icterisia. Initial Impression was ST segment elevation myocardial infarction, acute cholecystitis, hyperthyroidism, diabetes mellitus (DM) type 2.

At the ER, diagnostics were a repeat ECG that showed persistent anteroseptal wall ST-segment elevation and negative cardiac enzymes.

Acute coronary syndrome regimen was initiated; Nitrates, ARB, and anticoagulant. Echocardiogram showed normal ejection fraction (69%); concentric LVH with adequate wall motion and contractility. Other medications were methimazole 20 mg/ tab BID, bolus insulin, and ampicillin sulbactam 1.5 g IV every eight hours.

On the first hospital day, patient developed jaundice, icterisia and fever documented at 38°C. Patient was referred to surgery and was then scheduled for cholecystectomy with common bile duct exploration with intraoperative cholangiogram. Patient's thyroid function tests were FT4 29.69 (increased), TSH 0.0005 U/mL (decreased) which was indicative of uncontrolled hyperthyroidism. The impression was Impending thyroid storm (total score of 35 based Burch and Wartofsky). A repeat CBC showed increase in the WBC to 19,400, hence, sepsis secondary to cholecystitis was highly considered. Antibiotics were shifted to Piperacillin-tazobactam 4.5g IV every eight hours. The decision for surgery was done. Endocrine and cardio clearance were sought. Patient was prepared for surgery - Methimazole was shifted to Propylthiouracil 50 mg/tab four tablets every four hours, Dexamethasone 4.0 mg IV every 12 hours and propranolol 60 mg BID were also started.

On the fourth hospital day, patient underwent cholecystectomy. Intraoperative finding was gangrenous cholecystitis. Patient tolerated the procedure. Post operatively, there was resolution of symptoms and a repeat ECG showed resolution of the previous ST-segment elevation.

Patient was then discharged on the eighth hospital day improved with a final diagnosis of acute cholecystitis, HASCVD, Hyperthyroidism, DM type 2.

Discussion

We described a case with a chief complaint of epigastric pain and based on history and physical exam of the patient, an impression of acute cholecystitis was made. It was further backed by ultrasonographic findings of hydrops of the gallbladder and a leukocytosis of 19,400 cell/uL. Hydration, antibiotics and surgery are the treatment approach to the patient.

However, on further work-up, the ECG showed an ST-segment elevation on leads v1-3 (anteroseptal wall) which denotes an acute ischemic cardiac event. The clinical hallmark of acute coronary syndrome is chest pain. Though the patient did not present with chest pain rather an epigastric pain, according to Harrison's Principle of Internal Medicine, dyspnea and epigastric pain are angina equivalents. Also, the patient is diabetic which may contribute to the atypical presentation of ischemic heart disease. In diabetic patients, it is suspected that partial or complete autonomic denervation may contribute to the prevalence of silent ischemia.[2] The cardiac enzymes of the patient were negative, however, 2/3 diagnostic criteria for acute coronary syndrome were fulfilled. An acute coronary event was considered and cannot be ruled out at this time. The patient was initially managed as a case of acute coronary syndrome with acute cholecystitis.

Serial ECGs done showed persistent ST-segment elevation with persistent negative repeat enzymes. On further cardiac work-up, two-dimensional ECG showed adequate ejection fraction with normal left ventricular dimension and adequate wall motion contractility. According to Coven, absence of segmental wall-motion abnormality on echocardiogram during active discomfort is a highly reliable indicator of a nonischemic origin of symptoms.[4] Also, most patients initially presenting with ST-segment elevation ultimately evolves to Q waves on the ECG.[3] With the series of ECG done for the patient, there was no conversion of ST-segment elevation to Q waves. With the recent data, a nonischemic origin of ST-segment elevation was entertained.

A variety of noncardiac conditions have been reported to mimic ischemic heart disease both clinically and with ECG changes. Some of these include cholecystitis, pancreatitis, and pneumonitits. Usually these conditions lead to diffuse ECG changes, such as nonspecific T-wave inversions or ST-segment depressions.[5] Rarely does it lead to ST-segment elevation.

The patient tolerated the procedure and was discharged improved. There was resolution of symptoms and a resolution of the ST-segment elevation on ECG.

Biliary colic and cholecystitis are in the spectrum of biliary tract disease. Gallstones are divided into cholesterol stones (80%) and pigment stones (20%). Patients with gallstones may be asymptomatic or symptomatic once a stone obstructs or passes the cystic duct or common bile duct. Cholecystitis occurs when obstruction at the cystic duct is prolonged resulting in inflammation of the

gallbladder wall. It may occur in approximately 20% of patients.[5] Mucocele (hydrops) of the gallbladder is a term denoting an overdistended gallbladder filled with mucoid or clear and watery content. The condition can result from gallstone disease. The gallbladder mucocele distention, which is usually non-inflammatory, results from an outlet obstruction of the gallbladder and is commonly caused by an impacted stone in the neck of the gallbladder or in the cystic duct.[1]

The most common symptom is a constant pain in the epigastrium or right upper quadrant. Peritoneal irritation by direct contact with the gallbladder localized the pain to the right upper quadrant. Nausea, vomiting, and low-grade fever are associated more commonly with cholecystitis. Jaundice is unusual in the early stages of acute cholecystitis and may be found in fewer than 20% of patients. Frank jaundice may be seen with concomitant choledocholithiasis. Tachycardia and tachypnea maybe also be seen. A positive Murphy's sign is 97% sensitive and has positive predictive value of 93% for cholecystitis according to Singer et al. Diagnostics may include CBC. In an unpublished article by Steel et al entitled "Acute Cholecystitis and Biliary Colic", an elevated WBC of 11,000 cells/uL may suspect cholecystitis and a WBC greater than 15,000 cells/uL may indicate perforation or gangrene. Ultrasonography is 90-95% sensitive for cholecystitis and has a 78-80% specificity.[3]

On the first hospital day, patient still has persistent abdominal pain and new onset of fever and jaundice. Impression was sepsis secondary to acute cholecystitis, t/c gangrenous gallbladder, beginning cholangitis, r/o impending thyroid storm. The patient was referred to surgery for possible cholecystectomy, which is the definitive treatment.

Diabetic patients with cholecystitis are more likely to experience complications. Complicated cholecystitis has up to a 25% mortality rate. In men and diabetic patients with emphysematous gallbladder, there is a mortality rate of 15% and 25% mortality among patients with empyema or gangrenous gallbladder.[4] When gangrene or perforation are suspected, or if patients develop signs of instability (progressive fever, intractable pain) while on supportive therapy, intervention must be considered on an emergent basis to remove the offending inflamed, gangrenous, or perforated gallbladder. The decision to operate on the patient was done. However, pre-operative assessment and clearance proved to be difficult because the patient's comorbidities.

Thyrotoxic patients should ideally be as close as possible to clinical and biochemical euthyroidism before undergoing surgery. It is a clinical challenge to achieve perioperative control of thyrotoxicosis in acutely ill patients, most often requiring combined therapy or less than optimal control. For urgent or emergent surgery, rapid preoperative preparation could be attained using thionamides with Propylthiouracil 200mg every four hours. This could be combined with Betablockers, and high dose glucocorticoids. Dexamethasone will decrease T4-to-T3 conversion and have been used in the treatment of thyroid storm. Prognosis for adequately prepared patients is better, with decreased morbidity and mortality of adequately prepared patients.[8]

Adrenal reserve may be low in thyrotoxic patient. If time does not allow for completely adequate preparation prior to emergent surgery in the patient with severe hyperthyroidism, or if thyroid storm occurs, hydrocortisone can be given 100 mg IV every eight hours. This will not only treat possible adrenal insufficiency but may block peripheral conversion of T4 to T3 as well. Treatment of thyroid storm includes beta blockade, thioamides, iodinated contrast agents, iodine, and corticosteroids.[9]

The presence of Q waves or significant ST segment elevation or depression has been associated with an increased incidence of perioperative cardiac complications.[9] The patient was preoperatively cleared as high risk for surgery.

According to Patel et al in 2011, their case report[9] was only the fifth reported case of ST-segment elevation in acute cholecystitis, making our case report the sixth reported case, but the first one with uncontrolled hyperthyroidism.

The exact mechanism for the appearance of ST-segment elevation in acute cholecystitis is still unknown. According to a case report by Patel, the proposed mechanisms are the following:

1. Inflammation of the hepatobiliary system and pancreas, along with viral myocarditis has been noted to produce changes in the electrocardiogram.

2. Acute inflammatory and ulcerative conditions involving the gallbladder or duodenum cause irritation and spasticity of surrounding structures.

3. The pain induced by the irritation and spasticity of surrounding structures can create reflex stimuli through the autonomic pathways to restrict or alter the coronary blood supply.

4. It is possible that acute upper abdominal disease can prematurely reveal subclinical changes in the coronary circulation

5. The alterations in the ECG could have been caused by temporary myocardial ischemia, since the changes disappeared.

Conclusion

ST-segment elevation with a clinical setting suggestive of myocardial infarction justifies reperfusion therapy. However, clinicians should be aware of the uncommon causes of ST-segment elevation, as to our case acute cholecystitis, because the risk of reperfusion therapy outweighs any potential benefit. It is of importance for clinicians to diagnose acute cholecystitis right away as to avoid any complications such as sepsis, cholangitis or pancreatitis which can furthermore deteriorate patient's condition if not surgically managed. The dilemma to operate or not to operate is further complicated by the risk of the patient to develop thyroid storm because of the uncontrolled hyperthyroidism. Thus, a team approach in the management of this case as well as excellent clinical judgment proved beneficial to the patient.

References

1. **Fauci et. Al.** Ischemic Heart Disease. Harrison's Principle of Internal Medicine, 18th ed. 2012. 293: 1578-1593.
2. **Tabibiazar, Ramin, et al.** Silent Ischemia in People with Diabetes; A Condition that must be heard. Clinical Diabetes, 2003.
3. **Shea JA, Berlin JA, Escarce JJ, et al.** Revised estimates of diagnostic test sensitivity and specificity in suspected biliary tract disease. Arch Intern Med. 1994 Nov 28. 154(22):2573-81
4. **Hickman MS, Schwesinger WH, Page CP.** Acute cholecystitis in the diabetic. A case-control study of outcome. Arch Surg. 1988 Apr. 123(4):409-11
5. **Demehri FR, Alam HB.** Evidence-based management of common gallstone-related emergencies. J Intensive Care Med. 2016 Jan. 31 (1):3-13
6. **Coven, David et. Al. Acute Coronary Syndrome: Practice Essentials, Background, Etiology. September 2015.**
7. **Patel, Nimesh, et al.** Acute Cholecystits Leading to Ischemic ECG Changes in a Patient with No Underlying Cardiac Disease. Journal of the Society of Laparoendoscopic Surgeons, 2011; 15:105-108.
8. **Burch HB, Wartofsky L.,** Diagnostic Criteria for Diagnosis of Thyroid Storm. Endocrinol Clin North Am, 1993.
9. **Robert Schiff et.al.** Perioperative evaluation and management of the patient with endocrine dysfunction. Med Clin North Am 2003; 87:175-192
10. **Langley RW, et al.** Perioperative management of the thyrotoxic patient. Endocrinol Metab Clin N AM 2003; 32:519-534.
11. **A. Tsatsoulis, et. al.** The effect of thyrotoxicosis on thyrotoxicosisi on adrenocoritcal reserve. European Journal of Endocrinology (2000); 142 231-235
12. **Baron JF, et al.** Dipyridamole-thallium scintigraphy and gated radionuclide angiography to assess cardiac risk before abdominal aortic surgery. N Engl J Med 1994; 330:663.