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CLINICAL INFORMATION

ST-segment elevation during general anesthesia for non-cardiac surgery: a case of takotsubo



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Abstract

Background and objectives: Takotsubo cardiomyopathy, also known as broken heart syndrome is a stress-induced cardiomyopathy, which can be interpreted as an acute coronary syndrome as it progresses with suggestive electrocardiographic changes. The purpose of this article is to show the importance of proper monitoring during surgery, as well as the presence of an interdisciplinary team to diagnose the syndrome.

Case report: Male patient, 66 years old, with diagnosis of gastric carcinoma, scheduled for diagnostic laparoscopy and possible gastrectomy. In the intraoperative period during laparoscopy, the patient always remained hemodynamically stable, but after conversion to open surgery he presented with ST segment elevation in DII. ECG during surgery was performed and confirmed ST-segment elevation in the inferior wall. The cardiology team was contacted and indicated the emergency catheterization. As the surgery had not yet begun irreversible steps, we opted for the laparotomy closure, and the patient was immediately taken to the hemodynamic room where catheterization was performed showing no coronary injury. The patient was taken to the hospital room where an echocardiogram was performed and showed slight to moderate systolic dysfunction, with akinesia of the mid-apical segments, suggestive of apical ballooning of the left ventricle. Faced with such echocardiographic finding and in the absence of coronary injury, the patient was diagnosed with intraoperative Takotsubo syndrome.

Conclusion: Because the patient was properly monitored, the early detection of ST-segment elevation was possible. The presence of an interdisciplinary team favored the syndrome early diagnosis, so the patient was again submitted to safely intervention, with the necessary security measures taken for an uneventful new surgical intervention.

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PALAVRAS-CHAVE

Takotsubo;
 Síndrome coronária
 aguda;
 Anestesia geral;
 Angina;
 Infarto agudo do
 miocárdio;
 Choque cardiogênico

Supradesnivelamento do segmento ST durante anestesia geral para cirurgia não cardíaca: um caso de takotsubo

Resumo

Justificativa e objetivos: A cardiomiopatia de takotsubo, também conhecida como síndrome do coração partido, é uma cardiomiopatia induzida por estresse que pode ser interpretada como uma síndrome coronária aguda, pois cursa com alterações eletrocardiográficas sugestivas. O objetivo do presente artigo é mostrar a importância de uma monitoração adequada no intraoperatório, assim como a presença de uma equipe interdisciplinar para o diagnóstico da síndrome.

Relato de caso: Doente masculino, 66 anos, com o diagnóstico de carcinoma gástrico, proposto para laparoscopia diagnóstica e possível gastrectomia. No intraoperatório durante a laparoscopia manteve sempre estabilidade hemodinâmica, porém após a conversão para cirurgia aberta apresentou elevação do segmento ST em DII e foi feito um ECG no intraoperatório que confirmou supradesnivelamento do segmento ST em parede inferior. Foi contactada a equipe de cardiologia, que indicou cateterismo de urgência. Como a cirurgia ainda não havia iniciado passos irreversíveis, optou-se pelo encerramento da laparotomia e o doente foi levado imediatamente para a sala de hemodinâmica. Foi feito cateterismo que não evidenciou lesão nas coronárias. O doente foi levado para o internamento, onde foi feito um ecocardiograma que mostrava disfunção sistólica ligeira a moderada, com acinesia dos segmentos médio-apicais, imagem sugestiva de balonamento apical do ventrículo esquerdo. Diante de tal achado ecocardiográfico e na ausência de lesões coronárias, foi diagnosticada síndrome de takotsubo intraoperatória.

Conclusão: Devido ao fato de o doente estar monitorado de uma forma adequada foi possível a detecção precoce do supradesnivelamento do segmento ST. A presença de uma equipe interdisciplinar favoreceu o diagnóstico precoce da síndrome. Dessa forma o doente foi novamente intervencionado de forma segura e foram tomadas as devidas medidas de segurança, para que a nova intervenção cirúrgica transcorresse sem intercorrências.

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Introduction

Takotsubo syndrome, also known as broken heart syndrome, is a stress-induced cardiomyopathy defined as a transient and segmental left ventricular dysfunction or transient apical ballooning with electrocardiographic (ECG) changes suggestive of acute coronary disease, but with the absence of obstructive coronary artery disease.¹ This syndrome simulates acute coronary syndrome.²

The pathophysiology of takotsubo cardiomyopathy remains elusive. Many mechanisms have been proposed including myocardial ischemia caused by multivessel epicardial spasm, myocardial dysfunction induced by increased circulating catecholamines, and cardiac ischemia due to changes in the microcirculation.

The most likely hypothesis is that it is consequent to the sharp rise in serum catecholamine concentrations, which happens after a major emotional or physical stress (Wittstein et al.^{3,4}) and is determined by an abnormal release of catecholamines (norepinephrine) from CNS to cardiac sympathetic innervation. This release will evolve with dyskinesia of the left ventricular wall whenever there is a stressful situation.⁵ Clinically, patients may develop chest pain, sweating, palpitations, ECG changes suggestive of acute myocardial infarction.

It predominates in women (up to 95% of cases), mainly postmenopausal (mean age between 60 and 80 years). In less than 3%, it occurs in patients younger than 50 years. According to the American Heart Association classification (2006),⁶⁻⁸ it is defined as acquired primary cardiomyopathy and accounts for about 1–2% of the acute coronary syndrome cases, with incidence in the United States of about 7000–14,000 cases/year.

It was first described in Japan in 1990 by Sato et al.,^{1,9,10} and was named takotsubo because the image produced by the ventriculography is similar to the container used to catch octopus. The description of this syndrome has increased recently, with reports worldwide.

The diagnosis of takotsubo cardiomyopathy is difficult and will depend on diagnostic tests for exclusion of acute coronary syndrome, as its presentation is very similar. In its classic presentation, the patient has precordial pain, sweating and dyspnea, followed by ECG simulating a stream of myocardial injury, i.e., ECG may display ST-segment elevation, or T wave inversion, or prolonged QT interval. There may be a slight elevation of cardiac enzymes, but coronary angiography is normal.

The diagnosis is made with the use of echocardiogram, which will show an abnormal movement of the ventricular wall, characterized by the presence of transient dyskinesic

movement of the left ventricle anterior wall, with stress of kinetics of ventricular base, which causes a transient apical ballooning.⁹

Case description of takotsubo syndrome during surgery is rare because it is limited to an electrocardiographic finding, which may appear transiently during surgery, and its documentation is difficult.

Case report

Male patient, 66 years old, with a history of alcoholism and diagnosis of gastric carcinoma, scheduled for diagnostic laparoscopy and possible gastrectomy.

He was admitted to the Surgery Department with clinical findings of two months evolution, with general malaise, vomiting after meals (only tolerate liquid diet), epigastric pain, and 20 kg of weight loss. Upper gastrointestinal endoscopy with biopsy revealed peptic esophagitis + ulcer notch + gastric mixed-type carcinoma. Abdominal CT showed a large stasis with contrast accumulation and dilution into the gastric cavity, with limited passage in the pyloric region. It was difficult to see the contrast beyond that region during the examination time, and pyloric stenosis was assumed.

Before surgery, in the pre-anesthetic visit it was documented the presence of pyloric stenosis and normochromic normocytic anemia (Hb 9.7 g/dL), hyponatremia (Na 124 mol/L), and pre-stage renal failure in the recovery phase (initial urea (mg/dL) 171 and creatinine (mg/dL) 2.91, which on the day before were 84.7 mg/dL and 1.14 mg/dL, respectively). Preoperative ECG was normal and chest X-ray showed no changes.

Because it was an urgent situation, the patient was scheduled for surgery two days after hospitalization, and a balanced general anesthesia was proposed. The patient received metoclopramide 20 min before induction of anesthesia. In the operating room, he was placed in the supine position, and a new peripheral venous access was achieved with an 18G Abocath, serum therapy was started with isotonic solution (SF 0, %), and the patient was monitored with 5-lead cardioscope, pulse oximetry, and noninvasive blood pressure.

Intubation was performed with the patient awake. Previously, midazolam 2 mg and droperidol 0.625 mg were administered, and supraglottic anesthesia was administered with 10% lidocaine spray. The procedure was uneventful. The patient was intubated with 7.5 mm cuffed tube, without hemodynamic repercussions. After intubation, etomidate 20 mg, fentanyl 100 mcg, and atracurium 30 mg bolus + infusion at 0.3 mcg/kg/min were administered.

The surgical procedure was started. After the Veress needle introduction, a pneumoperitoneum was performed and the diagnostic laparoscopy started, which showed that the disease was located, and it was decided to proceed with total gastrectomy. At that time, a central venous catheter in the right internal jugular, using the Seldinger technique, uneventfully, and an invasive arterial line were placed and the laparotomy was started.

In the intraoperative period, after conversion to open surgery (laparotomy), it was noticed the presence of ST-segment elevation in DII, associated with a mild hypotension, maintained since the beginning of surgery. The

situation was reported to the surgery team and we opted for intraoperative ECG, which confirmed the presence of ST-segment elevation in the inferior wall. Analyzes with cardiac markers of myocardial ischemia were also performed.

At that time, the cardiology team was contacted and urgent catheterization was indicated. As the surgery had not yet begun irreversible steps, we opted for the laparotomy closure, and the patient was immediately taken to the hemodynamic room where catheterization was performed showing no coronary injury.

The patient was taken to the hospital room where an echocardiogram was performed and showed slight to moderate systolic dysfunction, with akinesia of the mid-apical segments, suggestive of apical ballooning of the left ventricle. Cardiac markers of the first hour were negative, and before such echocardiographic finding, with absence of coronary injury, the patient was diagnosed with intraoperative takotsubo syndrome.

Discussion

The main purpose of our case was to report a rare intraoperative event, which serves as a moment of reflection because it shows that everything is not what it seems; in other words, nothing could foresee that a patient who had no previous cardiac pathology would develop an acute coronary syndrome during surgery. The presence of ST-segment elevation on the ECG caused the interruption of the surgery, and the patient was submitted to an emergency catheterization.

After catheterization, many questions remained to be clarified, because the ST-segment elevation documentation was not accompanied by coronary injury to justify its appearance. Prinzmetal's angina or intraoperative coronary spasm triggered by surgical stress was initially hypothesized, but after the echocardiogram documenting the left ventricular apical ballooning, it became clear that it was takotsubo syndrome.

This was a difficult diagnosis because the case occurred during surgery with the patient anesthetized; that is, the only clinical finding was the ST-segment elevation and nothing could predict the course of events. The diagnosis of takotsubo syndrome was only possible due to the commitment of the entire team involved and also the important collaboration of the cardiology team, which performed the additional tests that enabled the diagnosis.

The takotsubo syndrome is a benign condition that if treated correctly leads to complete disappearance of symptoms and soon the heart returns to a normal dynamic, on average up to the 18th day of the onset of symptoms, which may be between 3 and 50 days.^{4,11} Prognosis seems to be favorable in the long run. The hemodynamic serious complications reported in the acute phase do not occur in most cases. The most frequent is acute pulmonary edema due to severe ventricular dysfunction, present in 1–3% of cases.¹² Generally, complete reversion of ventricular dysfunction observed by echocardiography and ECG normalization occur in three weeks. Tsuchihashi et al.¹³ reported hospital mortality rate of 1%, which is similar to the 1.7% observed by Pilgrim and Wyss¹⁴; with full recovery of cardiac function in 95.9% of cases.¹⁵ Recurrence in 4 years and in unspecified period was 0.16% and 3%, respectively.¹⁶

After the acute phase, there is no measure that is definitely beneficial to the natural evolution of takotsubo cardiomyopathy.¹⁷ Because it is a cardiomyopathy triggered by stress, the treatment is the prompt elimination of stress to the patient. If this is not possible, the end result may be the establishment of an irreversible clinical picture with cardiogenic shock and death.¹⁸

In this specific case, the stress was initially triggered by the surgical procedure (i.e., iatrogenic and non-emotional stress), as it is commonly described for this syndrome onset, but the physiopathological mechanism ends up being the same – there is a catecholamine release that act directly on the myocardial wall and trigger a transient left ventricular dysfunction and the appearance of the ST-segment elevation. This finding soon disappeared after the surgery, but the echocardiographic changes did not, which made it possible to diagnose the syndrome.

Conclusion

This case serves to show the need for the involvement of an interdisciplinary team in the diagnosis of takotsubo syndrome. The presence of adequate monitoring and also the teamwork enabled the patient to be safely submitted to a new surgical intervention, and the etiological diagnosis of ST-segment elevation was performed.

As the description of takotsubo intraoperative syndrome is rare, and after searching in the databases and only finding a few documented cases in the literature, we decided to submit this case to the publication, as the documentation of another case may serve as an example and help in the future differential diagnosis of new cases.

Conflicts of interest

The authors declare no conflicts of interest.

References

1. Dote K, Sato H, Tateishi H, et al. Myocardial stunning due to simultaneous multivessel coronary spasms: a re-view of 5 cases. *J Cardiol.* 1991;21:203–14.
2. Maron BJ, Towbin JA, Thiene G, et al. Contemporary definitions and classification of the cardiomyopathies. *Circulation.* 2006;113:1807–16.
3. Bybee KA, Kara T, Prasad A, et al. Systematic review: transient left ventricular apical ballooning: a syndrome that mimics ST-segment elevation myocardial infarction. *Ann Intern Med.* 2004;141:858–65.
4. Salathe M, Weiss P, Ritz R. Rapid reversal of heart failure in a patient with pheochromocytoma and catecholamine-induced cardiomyopathy who was treated with captopril. *Br Heart J.* 1992;68:527–8.
5. Prasad A, Lerman A, Rihal CS. Apical ballooning syndrome (takotsubo or stress cardiomyopathy): a mimic of acute myocardial infarction. *Am Heart J.* 2008;155:408–17.
6. Pilgrim TM, Wyss TR. Takotsubo cardiomyopathy or transient left ventricular apical ballooning syndrome: a systematic review. *Int J Cardiol.* 2008;124:283–92.
7. Mayo Clinic research reveals “broken heart syndrome” recurs in 1 of 10 patients.
8. American College of Cardiology. Heart disease and stroke statistics: 2007 update at a glance. http://www.americanheart.org/downloadable/heart/1166711577754HS_StatsInsideText.pdf [accessed 05.11.08].
9. Ito K, Sugihara H, Katoh S, et al. Assessment of takotsubo (ampulla) cardiomyopathy using 99mTc-tetrofosmin myocardial SPECT-comparison with acute coronary syndrome. *Ann Nucl Med.* 2003;17:115–22.
10. Yamanaka O, Yasumasa F, Nakamura T, et al. Myocardial stunning-like phenomenon during a crisis of pheochromocytoma. *Jpn Circ J.* 1994;58:737–42.
11. Akashi YJ, Nakazawa K, Sakakibara M, et al. 123I-MIBG myocardial scintigraphy in patients with takotsubo cardiomyopathy. *J Nucl Med.* 2004;45:1121–7.
12. Gianni M, Dentali F, Grandi AM, et al. Apical ballooning syndrome or takotsubo cardiomyopathy: a systematic review. *Eur Heart J.* 2006;27:1523–9.
13. Donohue D, Movahed MR. Clinical characteristics, demographics and prognosis of transient left ventricular apical ballooning syndrome. *Heart Fail Rev.* 2005;10:311–6.
14. Sharkey SW, Lesser JR, Zenovich AG, et al. Acute and reversible cardiomyopathy provoked by stress in women from the United States. *Circulation.* 2005;111:472–9.
15. Tsuchihashi K, Ueshima K, Uchida T, et al. Transient left ventricular apical ballooning without coronary artery stenosis: a novel heart syndrome mimicking acute myocardial infarction. Angina pectoris-myocardial infarction investigations in Japan. *J Am Coll Cardiol.* 2001;38:11–8.
16. Desmet WJ, Adriaenssens BF, Dens JA. Apical ballooning of the left ventricle: first series in white patients. *Heart.* 2003;89:1027–31.
17. Abe Y, Kondo M, Matsuoka R, et al. Assessment of clinical features in transient left ventricular apical ballooning. *J Am Coll Cardiol.* 2003;41:737–42.
18. Bybee KA, Prasad A, Barsness GW, et al. Clinical characteristics and thrombolysis in myocardial infarction frame counts in women with transient left ventricular apical ballooning syndrome. *Am J Cardiol.* 2004;94:343–6.