



Takotsubo cardiomyopathy – An unexpected complication in spine surgery

Niels Hammer^{a,*}, Christian Kühne^b, Jürgen Meixensberger^c, Bernd Hänsel^d, Dirk Winkler^c

^a Institute of Anatomy, University of Leipzig, Liebigstraße 13, D-04103 Leipzig, Germany

^b Department of Neuroradiology, University of Leipzig, Liebigstraße 20, D-04103 Leipzig, Germany

^c Department of Neurosurgery, University of Leipzig, Liebigstraße 20, D-04103 Leipzig, Germany

^d Department of Anesthesiology and Intensive Care Medicine, University of Leipzig, Liebigstraße 20, D-04103 Leipzig, Germany

ARTICLE INFO

Article history:

Received 24 March 2014

Received in revised form 18 June 2014

Accepted 6 October 2014

Available online xxx

Keywords:

Apical ballooning
Neurinoma
Stress-free surgery
Takotsubo cardiomyopathy

ABSTRACT

INTRODUCTION: Takotsubo cardiomyopathy is an apical ballooning syndrome, which can be triggered by stress. Only few case reports describe the onset of Takotsubo as a complication of neurosurgery procedures.

CLINICAL PRESENTATION: A case of a 53 year-old female with a spinal neurinoma and surgery-associated Takotsubo cardiomyopathy is demonstrated. The patient developed typical signs of a myocardial infarction with circulation depression and ST elevation, but normal cardiac enzymes at the end of surgery. Cardiac catheterization and levocardiography confirmed the absence of any critical coronary disease but the presence of a typical apical ballooning and midventricular hypokinesis. The patient recovered completely under supportive conservative and cardiological therapy, showing regular left ventricular pump function.

CONCLUSION: Interventions in neurosurgery and perioperative care should be kept as stress free as possible. Due to the possibility of neurogenic mechanisms related to cardiomyopathy, Takotsubo cardiomyopathy as an entity of stress-induced complications should be taken into consideration.

Crown Copyright © 2014 Published by Elsevier Ltd. on behalf of Surgical Associates Ltd. This is an open access article under the CC BY-NC-SA license (<http://creativecommons.org/licenses/by-nc-sa/3.0/>).

1. Introduction

Takotsubo cardiomyopathy is an entity of non-ischemic cardiomyopathy in which there is a sudden but temporary weakening of the myocardium.¹ The clinical presentation of Takotsubo is similar to that of an acute myocardial infarction.² Symptoms are acute substernal chest pain, dyspnea, syncope, shock, or electrocardiographic abnormalities. In contrast to these clinically impressive symptoms, further diagnostics cannot confirm a coronary syndrome with the signs of coronary occlusion and ischemic lesions. The onset of Takotsubo can be triggered by emotional stress or constant anxiety and unexpected catastrophic conditions.^{2,3}

2. Case report

A 53 year-old woman was admitted to neurosurgery because of emerging gait disturbances and unspecific pain in the region of the lumbosacral spinal column. Clinical examination confirmed

a spinal ataxia and pain radiating over the lower spine. Spine MRI visualized a space-occupying extradural lesion on the level of the ninth thoracic vertebra, suspected of being a typical neurinoma lesion, confirming an indication for surgical removal. Prior to admission the patient received no oral medications such as digitalis, ACE inhibitors, angiotensin-II receptor antagonists, or β -blockers and offered 12-channel-ECG without abnormalities.

After anesthesiological and clinical preparation including tibialis somatosensory and motor evoked potentials without pathologies, surgery was carried out. The patient was lying in a prone position with constant monitoring under general anesthesia by means of propofol and sufentanil. Following fluoroscopy and skin incision, the Th9 lamina was explored and removed under intermittent ultrasound confirming the correct intraoperative positioning. The neurinoma was visualized and removed microsurgically. Shortly before completion, sudden circulation (84/60 mmHg) and blood gas analysis disturbances were observed (endexpiratory pCO₂ 24 mmHg, capillary pO₂ pressure 84%). The intraoperative ECG showed acute ST elevations (Fig. 1), as typically associated with acute myocardial infarction. Due to pump-failure related hypotension, medication was adapted as follows: noradrenaline at 0.12 μ g/kg/min and dobutamine at 2 μ g/kg/min via feeding pump, adrenaline in fractions of 1.8 mg

* Corresponding author. Tel.: +49 0341 97 22053; fax: +49 0341 97 22009.
E-mail address: niels.hammer@medizin.uni-leipzig.de (N. Hammer).
URL: <http://www.uni-leipzig.de/anatomie> (N. Hammer).

<http://dx.doi.org/10.1016/j.ijscr.2014.10.002>

2210-2612/Crown Copyright © 2014 Published by Elsevier Ltd. on behalf of Surgical Associates Ltd. This is an open access article under the CC BY-NC-SA license (<http://creativecommons.org/licenses/by-nc-sa/3.0/>).

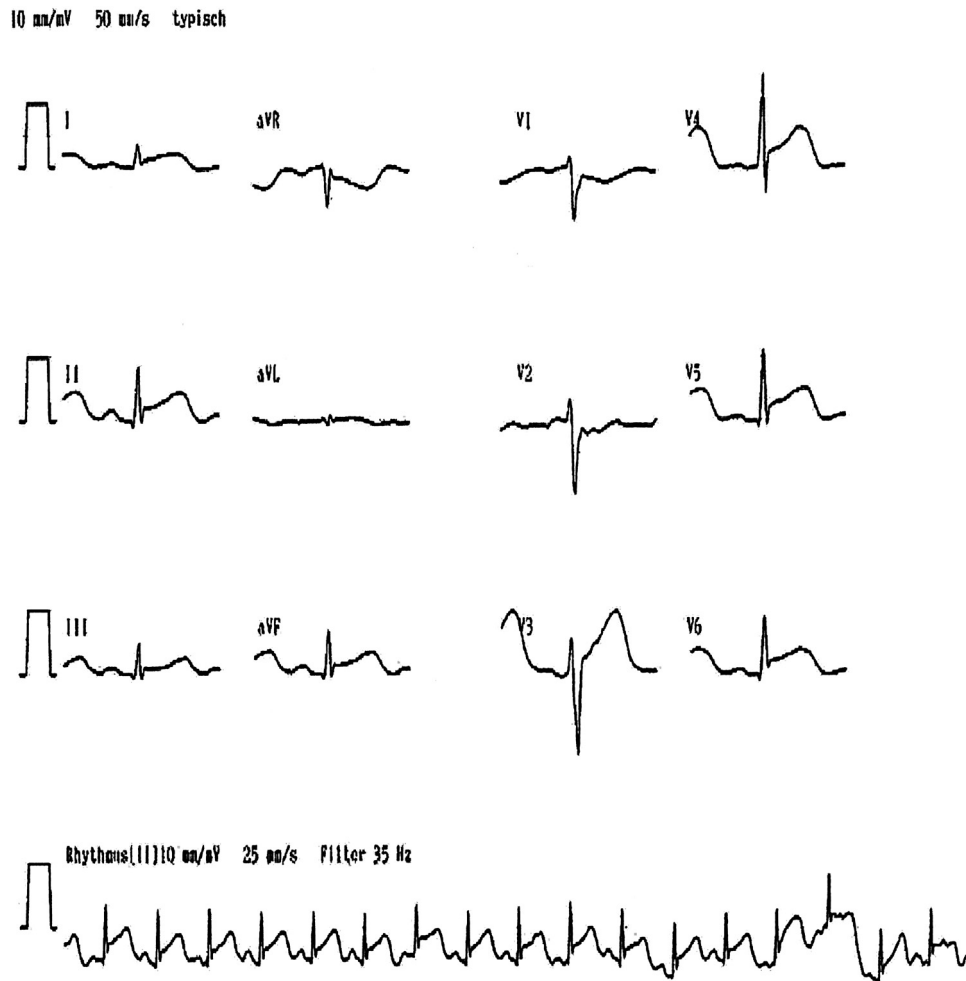


Fig. 1. The intraoperative ECG showed acute myocardial infarction like changes and ST segment elevations in the I–III, aVR and the V3 to V6 leads.

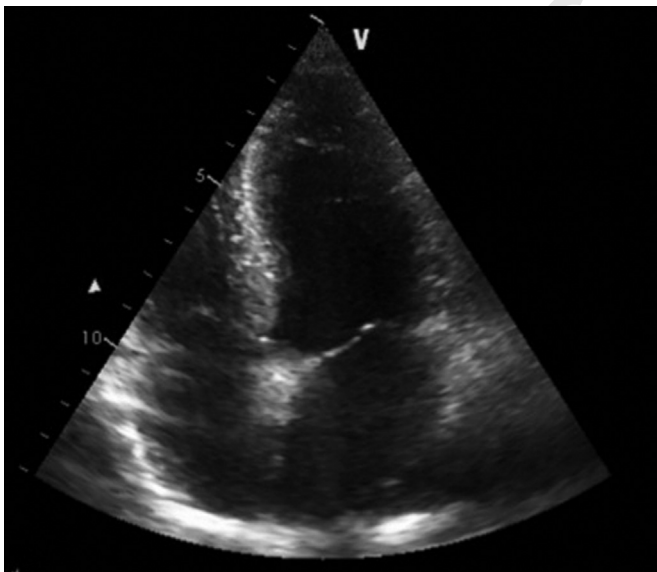


Fig. 2. Echocardiography showed characteristic kinetic disturbances in the apical heart region.

and cafedrin–theodrenaline in 80 mg boluses. Acetylsalicylic acid (500 mg) was administered for the suspected diagnosis. Sufentanil (0.2 µg/kg/h), propofol (6 mg/kg/h) and midazolam (5 mg boluses) were continuously administered via feeding pump until the

surgery was finished. Cardiac enzymes, including CK and CK-MB, remained at normal levels at all times. In cardiac angiography, no critical coronary disease was observed, but the presence of a typical apical ballooning and midventricular hypokinesis (Fig. 2). The following levocardiography showed the typical octopus pot configuration of the heart (Fig. 3). After diagnosing the Takotsubo cardiomyopathy, therapy was adapted symptomatically upon the patient's overall clinical condition. Metoprolol (47.5 mg twice daily) and ramipril (5 mg once daily) were administered to prevent volume overload and to exclude further events. Anticoagulation therapy was stated with nadroparine for the first three days due to the risk of a left ventricular thrombus. The administration of acetylsalicylic acid was stopped because of the absence of a coexisting coronary atherosclerosis.

The patient recovered completely within one week under conservative therapy and cardiological support. She was discharged with metoprolol and ramipril at the given dosages. Clinical and diagnostic controls in the follow-up confirmed a stable cardiac functionality. No further cardiac events recurred in the 4 years follow-up.

3. Discussion

The presented case describes the rare but impressive onset of Takotsubo in the context of spinal neurosurgery for the first time. Some authors found a coincidence of surgical interventions and the onset of Takotsubo.^{4–10} Artukoglu and coworkers describe a

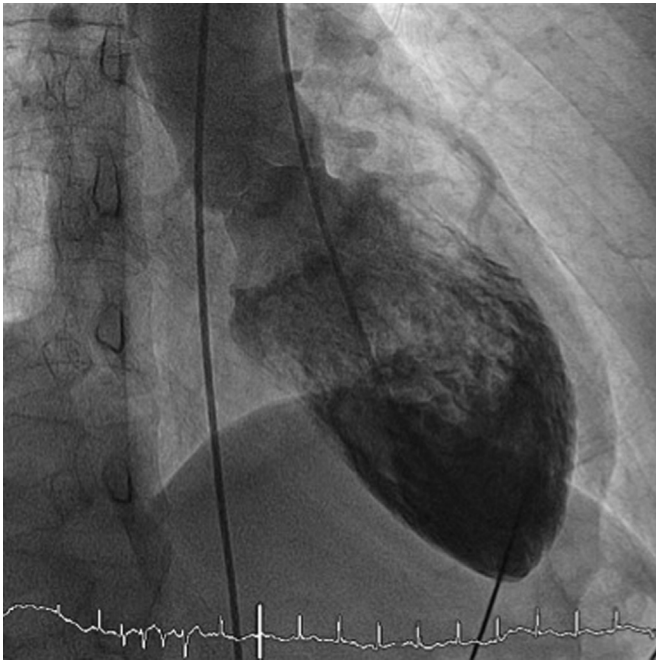


Fig. 3. Levocardiography in the right anterior oblique position shows the picture of an octopus pot, which is characteristic for Takotsubo cardiomyopathy.

case of Takotsubo in the context of knee arthroscopy.⁵ Gologorsky and Gologorsky present the case of a 43 year-old female that developed the signs of Takotsubo intraoperatively during lumbar interbody fusion.⁸ Takotsubo has also been described in patients undergoing radiofrequency ablation therapy of hepatic tumors⁹ or ophthalmic surgery.⁶ These cases support the theory that stressful events may trigger Takotsubo. A sudden surgical pain stimulus combined with insufficient analgesia are hypothesized to probably cause a catecholamine surge in Takotsubo.⁵ High circulating levels of catecholamines seem to cause catecholamine-induced microvascular spasms with subsequent myocardial dysfunction and stunning.¹¹ Akashi et al. concluded a possible reflect activation of central neurogenic mechanisms similar to those evoked by subarachnoid hemorrhage.⁴ However, elevated blood catecholamine levels are not always present.¹²

Takotsubo is characterized by ST segment elevations especially in the anterior precordial leads, deep T wave inversions or abnormal Q waves.¹³ Also normal ECG presentations were described.³ Clinical findings are heart failure, brady- or tachyarrhythmia, mitral regurgitation, cardiogenic shock and pulmonary edema.^{2,4} Paraclinical findings are mildly elevated cardiac biomarkers such as high-sensitivity troponin assays or CK levels.¹⁴ Levocardiography displays the apical ballooning and immobility,^{2,3} justifying the Japanese name or octopus pot, where this syndrome was described at first. Coronary angiography typically fails to demonstrate severely atherosclerotic vessels. In the presented case, the clinical signs were typical for an acute ischemic heart attack with hypotension and ST elevation in the anterior precordial leads. The paraclinical signs were unspecific and biomarker levels remained normal all times. Despite the acute heart failure and the ECG alterations, no persisting morphological changes, obstructive coronary heart disease or plaque ruptures were seen. There were no predictors or clinical signs suspected for Takotsubo during spine surgery

except for the female gender. Takotsubo is seen in post-menopausal females in 80 percent of all cases.^{4,11}

Patients who survive the acute episode typically recover to normal ventricular function within four weeks. The prognosis is determined by the acute complications of Takotsubo. Despite the severity of the acute illness, Takotsubo is a transient disorder manageable with supportive therapy. Conservative treatment with resolution of the physical or emotional stress usually results in rapid resolution of symptoms. There are no controlled data to define an optimal medical regimen, but it seems reasonable to treat these patients with standard medications for left ventricular systolic dysfunction. These include ACE inhibitors, β -blockers and diuretics to prevent volume overload. However, because the condition may recur, on-going adrenergic blockade with β -blockers is suggested. Consequently, Takotsubo is a transient disorder managed with the resolution of physical or emotional stress and supportive therapy. Due to the personal needs in case of elective neurosurgery and the possibility of neurogenic mechanisms in triggering of Takotsubo, surgical interventions and perioperative care should be realized under stress-free conditions as far as possible.

Conflict of interest

The authors report no conflict of interest concerning the materials or methods used in this study or findings specified in this paper. Consent was ratified from the patient for publishing this case report.

References

- Sato H, Taiteushi H, Uchida T. Takotsubo-type cardiomyopathy due to multivesel spasm. In: Kodama K, Haze K, Honm M, editors. *Clinical aspect of myocardial injury: from ischemia to heart failure*. Tokyo: Kagakuhyouronsha; 1990. p. 56–64.
- Sharkey SW, Lesser JR, Zenovich AG, Maron MS, Lindberg J, Longe TF, et al. Acute and reversible cardiomyopathy provoked by stress in women from the United States. *Circulation* 2005;**111**(4):472–9.
- Wittstein IS, Thiemann DR, Lima JAC, Baughman KL, Schulman SP, Gerstenblith G, et al. Neurohumoral features of myocardial stunning due to sudden emotional stress. *N Engl J Med* 2005;**352**(6):539–48.
- Akashi YJ, Goldstein DS, Barbaro G, Ueyama T. Takotsubo cardiomyopathy: a new form of acute, reversible heart failure. *Circulation* 2008;**118**(25):2754–62.
- Artukoglu F, Owen A, Hemmerling TM. Tako-Tsubo syndrome in an anaesthetised patient undergoing arthroscopic knee surgery. *Ann Card Anaesth* 2008;**11**(1):38–41.
- Dersch W, Rolfes C, Wulf H. Kasustik – Tako-Tsubo-Syndrom nach Allgemeinanästhesie. *Anesthesiol Intensivmed Notfallmed Schmerzther* 2012;**47**(1):22–4.
- Dimski T, Heinen-Lauten J, Krep H. Basale Tako-Tsubo-Kardiomyopathie. Erstmanifestation eines Phäochromozytoms nach einer Allgemeinanästhesie. *Anaesthesist* 2008;**57**(2):143–6.
- Gologorsky E, Gologorsky A. Intraoperative stress cardiomyopathy. *J Am Soc Echocardiogr* 2010;**23**(3), 340.e3–4.
- Joo I, Lee JM, Han JK, Choi BI, Park E. Stress (tako-tsubo) cardiomyopathy following radiofrequency ablation of a liver tumor: a case report. *Cardiovasc Intervent Radiol* 2011;**34**(Suppl. 2):S86–9.
- Pfister S, Wagar P, Casserly IP. Stress-related cardiomyopathy in a 31-year-old woman. *AANA J* 2010;**78**(5):406–11.
- Azzarelli S, Galassi AR, Amico F, Giacoppo M, Argentino V, Tomasello SD, et al. Clinical features of transient left ventricular apical ballooning. *Am J Cardiol* 2006;**98**(9):1273–6.
- Madhavan M, Borlaug BA, Lerman A, Rihal CS, Prasad A. Stress hormone and circulating biomarker profile of apical ballooning syndrome (Takotsubo cardiomyopathy): insights into the clinical significance of B-type natriuretic peptide and troponin levels. *Heart* 2009;**95**(17):1436–41.
- Sharkey SW, Lesser JR, Menon M, Parpart M, Maron MS, Maron BJ. Spectrum and significance of electrocardiographic patterns, troponin levels, and thrombolysis in myocardial infarction frame count in patients with stress (tako-tsubo) cardiomyopathy and comparison to those in patients with ST-elevation anterior wall myocardial infarction. *Am J Cardiol* 2008;**101**(12):1723–8.
- Sharkey SW, Windenburg DC, Lesser JR, Maron MS, Hauser RG, Lesser JN, et al. Natural history and expansive clinical profile of stress (tako-tsubo) cardiomyopathy. *J Am Coll Cardiol* 2010;**55**(4):333–41.

Open Access

This article is published Open Access at sciedirect.com. It is distributed under the [IJSCR Supplemental terms and conditions](#), which permits unrestricted non commercial use, distribution, and reproduction in any medium, provided the original authors and source are credited.