CASE REPORT

Inferolateral ST-segment elevation associated with a gastric variceal bleed and the use of a Minnesota tube

Duncan R B Birse

Department of Critical Care,
Royal Infirmary of Edinburgh,
Edinburgh, UK

Correspondence to

Dr Duncan R B Birse,
duncan.birse@googlemail.com

SUMMARY

The use of Minnesota and modified Sengstaken-Blakemore tubes for balloon tamponade in acute variceal haemorrhage has declined with the availability of modern endoscopic techniques. However, in massive uncontrolled haemorrhage their use may still be required. They are very effective in controlling acute bleeding, but are associated with a range of potentially serious complications. This case demonstrates an unusual complication of the use of a Minnesota tube in a gentleman with a large gastric variceal bleed. The patient developed inferolateral ST-segment elevation on a 12-lead ECG which resolved rapidly following aspiration of 2000 mL of blood from the gastric port of the Minnesota tube. It was thought that the distension of the stomach, along with the traction applied to the Minnesota tube, resulted in external compression of the diaphragmatic surface of the heart and the observed ECG changes.

BACKGROUND

The availability of modern endoscopic techniques, such as band ligation and injection sclerotherapy, to control bleeding in active variceal haemorrhage has resulted in modified Sengstaken-Blakemore tubes or Minnesota tubes being used less frequently. Their use is still required in cases of massive uncontrolled variceal haemorrhage to provide balloon tamponade, in an attempt to control bleeding, while awaiting other forms of treatment.¹

Balloon tamponade is highly effective in controlling acute bleeding in up to 92% of oesophageal and 88% of gastric variceal haemorrhage.² However, the use of modified Sengstaken-Blakemore tubes and Minnesota tubes is associated with a range of serious complications including aspiration pneumonia, upper airway obstruction, oesophageal ulceration, necrosis and perforation.¹⁻⁴ For this reason, appropriate anaesthetic support should be sought and most patients will now undergo sedation and endotracheal intubation prior to balloon tamponade. The overall rate of complications is estimated at approximately 15–20%.¹

This case demonstrates an unusual complication associated with the use of a Minnesota tube in a patient with large gastric variceal haemorrhage.

CASE PRESENTATION

A 63-year-old man with liver cirrhosis due to non-alcoholic fatty liver disease was admitted for an elective procedure involving injection of thrombin

into a large gastric varix under general anaesthetic. Unfortunately, after injection, there was brisk haemorrhage in the stomach with significant haemodynamic instability. It was not possible to control the bleeding with endoscopic measures and a Minnesota tube was inserted. The gastric balloon was inflated and traction applied in an attempt to tamponade the bleeding. Following fluid resuscitation he was transferred to the interventional radiology lab for an emergency insertion of a transjugular intrahepatic portosystemic shunt (TIPSS). This procedure was prolonged as multiple attempts were required to fit the shunt. However, after insertion the portal pressure gradient was reduced from 15 to 7 mmHg.

On completion of the procedure the patient was admitted to the intensive care unit for ongoing management. On admission it was noticed that he had significant ST-segment elevation in lead II on the cardiac monitor, and this was confirmed by a 12-lead ECG (figure 1). The ECG showed 2 mm of ST-segment elevation in leads II, III and aVF, 2 mm of ST-segment elevation in leads V₄ to V₆ and 1–2 mm of ST-segment depression in leads V₁ to V₃. These changes were not present on previous ECGs and were clearly concerning for the possibility of an inferolateral ST elevation myocardial infarction. However, it was noted at the time that the morphology of the ST-segment was unusual and not typical of an ST elevation myocardial infarction. The patient was coagulopathic at the time, with an INR of 1.8, and despite being intubated and sedated, demonstrated no other features of an acute myocardial infarction. A portable chest X-ray was performed, which confirmed the position of the gastric balloon of the Minnesota tube in the stomach (figure 2).

TREATMENT

After discussion with the on-call cardiology registrar, it was decided that if the ECG changes did represent an acute myocardial infarction, this should be managed conservatively. The risk of further bleeding in this critically unwell patient was unacceptably high with the use of antiplatelet therapy or the intravenous heparin required for primary percutaneous coronary intervention. As a result, the patient received no active treatment for the ECG changes.

However, during routine nursing care of the Minnesota tube, 2000 mL of blood was aspirated from the gastric port. This resulted in almost

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Figure 1 A 12-lead ECG showing inferolateral ST-segment elevation after admission to the intensive care unit with the Minnesota tube in situ prior to aspiration of 2000 mL of blood from the stomach.

immediate resolution of the ST-segment elevation on the cardiac monitor and within 3 h the ECG changes had completely resolved (figure 3). This was the first time that the gastric port had been aspirated following insertion of the Minnesota tube several hours ago. The gastric balloon had clearly not been providing effective tamponade during the prolonged insertion of a TIPSS. It is likely that this blood had accumulated during this time causing a significant distension of the stomach and an external compression of the heart. A troponin I level, measured at 12 h after the initial ECG changes, was recorded at 0.06 ng/mL, making a large inferolateral myocardial infarction unlikely.

OUTCOME AND FOLLOW-UP

With the use of blood products to correct coagulopathy, the patient's bleeding stopped within the next 12 h allowing deflation of the gastric balloon and removal of the Minnesota tube. He required ongoing sedation and ventilation due to hepatic encephalopathy for 5 days, but following extubation, he was

discharged to the ward. He has had no further episodes of variceal bleeding or chest pain and ECG changes, but continues to make a prolonged recovery due to ongoing, but gradually improving, hepatic encephalopathy.

DISCUSSION

Given the almost immediate resolution of the ST-segment elevation following aspiration of the gastric contents, and the relatively small troponin I rise after 12 h, it was felt that the ECG changes were probably the result of a significant gastric distension. It is likely that the accumulation of blood in the stomach, along with the traction being applied to the Minnesota tube, resulted in external compression of the diaphragmatic surface of the heart. The pattern of ST-segment elevation could be explained by external compression of the left circumflex artery and posterior interventricular branch of the right coronary artery, both of which are located on the diaphragmatic surface of the heart. However, the troponin I level was only very slightly raised, suggesting complete external occlusion of the coronary arteries resulting in a myocardial infarction is unlikely to have occurred.

There have been several other case reports of external compression of the heart resulting in ST-segment elevation, however, these have usually been associated with anatomical variants, for example, a distended stomach conduit^{5 6} or a large hiatus hernia.^{7 8} There is also one report of ischaemic ECG changes caused by oesophageal food impaction.⁹ In each case, the ECG changes resolved rapidly after correction of the cause of external cardiac compression, and where a subsequent troponin level was measured it was either undetectable or minimally raised. The exact mechanism by which external compression of the heart causes ST-segment elevation, which resolves rapidly when the pressure is relieved and is not associated with a significant troponin rise, remains unclear.

Advice surrounding the care of modified Sengstaken-Blakemore tubes and Minnesota tubes recommends regular aspiration of the gastric port, along with other checks of traction and balloon pressures.¹⁰ Indeed, the hospital policy was for aspiration of the gastric port every hour. This had not been performed during the prolonged TIPSS insertion and as the patient had remained

Figure 2 Portable anteroposterior chest X-ray showing placement of the gastric balloon of the Minnesota tube in the stomach below the diaphragm.

Figure 3 A 12-lead ECG showing almost complete resolution of the previous ST-segment elevation, with artefact in lead V₄, after aspiration of 2000 mL of blood from the stomach.

haemodynamically stable during this procedure, it was not evident that the gastric balloon was not providing adequate tamponade of the bleeding gastric varix.

This case demonstrates an unusual complication from the use of a Minnesota tube in a patient with a bleeding gastric varix. External compression of the heart is a rare cause of ST-segment elevation, but serves to remind that other causes of ST-segment elevation should be considered if the clinical picture is not in keeping with myocardial infarction.¹¹ It should be remembered that the use of balloon tamponade in variceal haemorrhage is not without potentially serious complications.

Learning points

- ▶ The use of Minnesota and modified Sengstaken-Blakemore tubes is associated with a range of potentially serious complications.
- ▶ External compression of the heart is a rare cause of ST-segment elevation.
- ▶ Minnesota and modified Sengstaken-Blakemore tubes should undergo regular nursing checks, including aspiration of the gastric port to identify ongoing bleeding and reduce the risk of complications.

Competing interests None.

Patient consent Obtained.

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