Traumatic tricuspid regurgitation and right-to-left intra-atrial shunt: an unusual complication of a horse-kick

RA Byrne, S Fleming, M Tolan, S Fleming, C Tolan, M Tolan

Abstract
A 63 year old male presented with sudden onset chest pain and dyspnoea following a kick to the praecordium while castrating a horse. Physical examination revealed evidence of a hoof-print on the anterior chest wall (Figure 1A), and a harsh pan-systolic murmur loudest at the left sternal edge. Transthoracic echocardiography showed evidence of flail tricuspid valve leaflets (Figure 2A), severe tricuspid regurgitation and a widely patent foramen ovale with a right-to-left shunt. Transthoracic echocardiography was performed in association with tricuspid annuloplasty and suture closure of his patent foramen ovale. Disruption of the tricuspid valve is well described as a consequence of blunt trauma to the chest wall and is often well tolerated, coming to light many years post injury. Valve disruption due to rupture at the papillary muscle level, however, typically results in greater severity of tricuspid regurgitation and the abrupt rise in right intra-atrial pressure may lead to a right-to-left shunt across a patent foramen ovale. Where hemodynamic compromise ensues, prompt surgical intervention is mandated.

Case Report
A 63 year old male with a background history of known coronary artery disease and coronary artery bypass surgery 20 years previously, presented with sudden onset chest pain and dyspnoea after suffering a kick to the praecordium while castrating a horse. Transthoracic echocardiography revealed evidence of a hoof-print on the anterior chest wall (Figure 1A), and a harsh pan-systolic murmur loudest at the left sternal edge. Transthoracic echocardiography showed evidence of flail tricuspid valve leaflets (Figure 2A), severe tricuspid regurgitation and a widely patent foramen ovale (Figure 2B) with a right-to-left shunt. Coronary angiography revealed severe native 3-vessel disease and bypass graft blockage revealed 2 aortic vein grafts and a patent internal mammary artery graft to the left anterior descending artery. Transthoracic echocardiography confirmed rupture of the anterior (Figure 1B, arrow) and smaller septal tricuspid valve papillary muscles, as well as the presence of a patent foramen ovale. Successful papillary muscle reattachment was performed in association with tricuspid annuloplasty, suture closure of his patent foramen ovale and 2-vessel coronary bypass grafting. He was discharged from hospital well on day 7 post-op and has made uneventful progress to date.

Discussion
Valve injury is a rare complication of blunt cardiac injury. 1-10 Disruption of the tricuspid valve apparatus following blunt trauma to the anterior chest wall is well described, 1,2 and may occur at the level of the valve leaflets, chordae tendineae or papillary muscles. 3-5 Autopsy series report that left-sided AV valve disruption is a more common consequence of chest trauma, though this is likely a function of higher case fatality rates with mitral valve rupture. Right-sided valve disruption - especially regurgitation caused by chordal rupture or leaflet tearing - may be hemodynamically well tolerated and relatively clinically silent, first coming to light many years post injury.

Isolated tricuspid valve rupture at the level of the papillary muscle, on the other hand, is less frequently reported and, as in this case, may be missed on imaging studies. 6,7 The atrophic papillary muscle is usually the largest, providing support to both anterior and posterior leaflets as well as attachment to the moderator band. 8,9 Valve disruption in association with patent foramen ovale and a significant secondary right-to-left shunt is a forensic compression of the right ventricle resulting in a transient outflow obstruction accompanied by an abrupt rise in right ventricular pressure leading to acute pulmonary hypertension and possibly fatal arrhythmia. 10 A secondary increase in right atrial pressure follows, leading to the development of a right-to-left intra-atrial shunt. 11 In cases associated with hemodynamic compromise, prompt surgical intervention is mandated though in clinically stable cases the role of intervention is less certain.

Acknowledgements
RAB was supported by a Research Fellowship in Atherothrombosis from the European Society of Cardiology.

References