

Post Traumatic Ventricular Septal
Defect Closure Using an Occlutech
Patent Ductus Arteriosus Occluder

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Article Information

Received date: Jun 23, 2017

Accepted date: Jul 03, 2017

Published date: Jul 05, 2017

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Keywords Post- traumatic ventricular
septal defect; Trauma; Percutaneous
closure; Occlutech PDA Occluder

Abbreviations ASD: Atrial Septal Defect;
CT SCAN: Computed Tomography; ICD:
Intercostal Drainage; MRI: Magnetic
Resonance Imaging; PDA: Patent Ductus
Arteriosus; VSD: Ventricular Septal
Defect

Abstract

Background: Traumatic Ventricular Septal Defect (VSD) is an uncommon occurrence in cases of penetrating cardiac injury with an incidence of only 1% to 5%. Most patients require cardiac surgical or percutaneous device closure to ensure survival.

Objective: We report on a patient who had transcatheter closure of post traumatic ventricular septal defect with the Occlutech Patent Ductus Arteriosus Occluder device.

Methods: We treated an adult patient with post-traumatic ventricular septal defects caused by stab wound with a knife. The post traumatic ventricular septal defect was closed percutaneously with the Occlutech Patent Ductus Arteriosus Occluder.

Results: Post traumatic ventricular septal defect was closed successfully percutaneously with no residual VSD on fluoroscopy and echocardiogram. Patient was discharged the following day.

Conclusion: Our experience indicate that closure of a post traumatic ventricular septal defect using the Occlutech Patent Ductus Arteriosus Occluder is feasible, safe and effective in carefully selected patients.

Introduction

Traumatic Ventricular Septal Defect (VSD) is an uncommon occurrence in cases of penetrating cardiac injury with an incidence of only 1% to 5% [1]. Autopsy data suggest an incidence of about 5% for VSD associated with other cardiac injuries [2]. Patients with a post-traumatic VSD are variable in their clinical presentation, course, and severity, and consequently, they may be difficult to diagnose [3]. Echocardiography is the most effective diagnostic tool, although cardiac catheterization, Computerized Tomography (CT) or Magnetic Resonance Imaging (MRI) is sometimes required for further assessment [1,3]. Most patients require cardiac surgical or percutaneous device closure to ensure survival [3]. In this procedure, an Amplatzer VSD Occluder has usually been employed [4], or occasionally, an Atrial Septal Defect (ASD) Occluder has been used [5].

We report our experience with percutaneous closure of post traumatic ventricular septal defect with Occlutech PDA Occluder device following failure of Amplatzer muscular ventricular Occluder to close the device.

Case Reports

We report on adult patients that presented with a VSD murmur following stab chest injury. The VSD was closed with an Occlutech PDA Occluder device.

Case

A 22 years old male patient who presented to adult cardiology clinic (Provincial Hospital) 5 months after he was stabbed in the chest. The patient was treated for chest stab wound at Livingstone Hospital in May 2016. He had left sided hemothorax and an Intercostal Drainage (ICD) was inserted to drain the blood and the patients were discharged home after he recovered. The VSD was not diagnosed at presentation. He was found to have a pan systolic murmur on follow up, and was then referred to adult cardiology clinic. On arrival patient was hemodynamically stable with normal vital signs and was not in heart failure.

Investigations

Chest radiography was normal. Electrocardiogram showed normal sinus rhythm, no left ventricular hypertrophy. Echocardiography showed high muscular VSD with left to right shunting (Figure 1a).

Diagnostic cardiac catheterisation: Showed normal pulmonary artery pressures (mean=24mmHg), PVR=0.38 and high Qp/Qs of 3.4: 1 due to a left to right shunting across the VSD.



Figure 1a: Echo at presentation.



Figure 1d: Echo post device closure.



Figure 1b: LV angiogram.

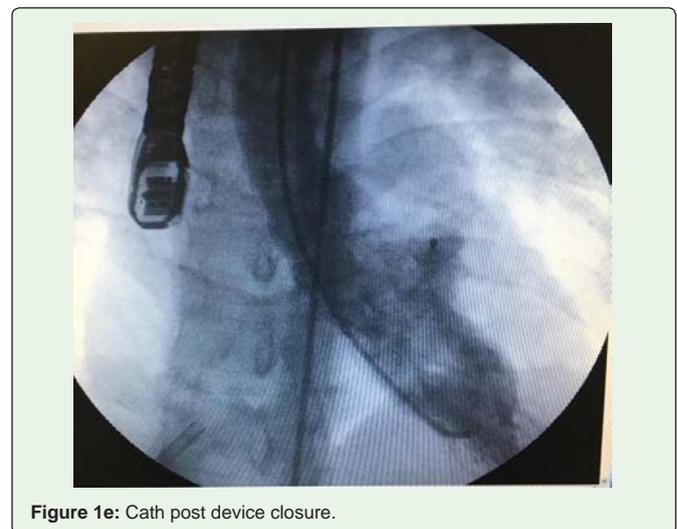


Figure 1e: Cath post device closure.

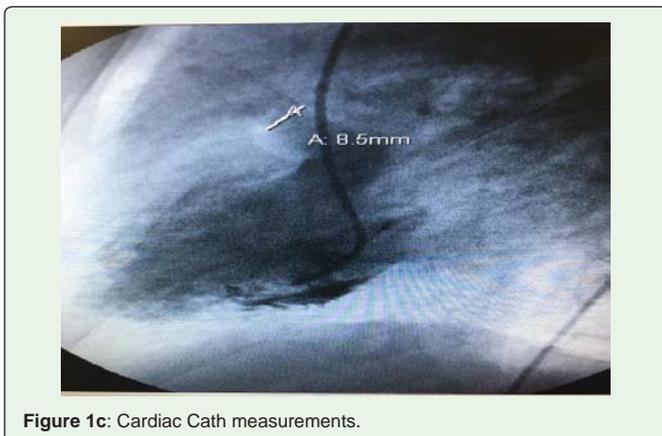


Figure 1c: Cardiac Cath measurements.

Percutaneous closure: Cardiac catheterisation with a femoral approach was performed using general anaesthesia. A left ventricular angiogram was done and disclosed a significant left to right shunt across the large defect in the muscular ventricular septum (Figure 1b). The VSD was measured using the fluoroscopy (Figure 1c). Initially Amplatzer muscular VSD Occluder was selected to close the defect, the device formed cobra deformity during the deployment and could

not be released. An Occlutech PDA Occludersize 14 X 18mm was then selected. The PDA was then successfully closed with no residual PDA flow on echocardiography (Figure 1d) and fluoroscopy (Figure 1e).

Discussion

Cardiac injury occurs in approximately 20-30% of cases of major chest trauma [6]. In the majority of cases, the injuries are fatal. Survival depends upon rapid diagnosis and treatment.

A VSD due to penetrating cardiac injury can occur directly, due to perforation of the septum, or indirectly, following injury of an epicardial coronary artery with necrosis and subsequent rupture [7].

There are reports of delayed VSD presentation in which initial echocardiography was normal, but subsequent echocardiograms revealed a defect [8]. The diagnosis of a VSD following trauma may be challenging. Investigation should include elements of the history and clinical examination, as well as information gained at plain chest radiograph, cardiac enzymes, echocardiography, and nuclear imaging studies. Transthoracic echocardiography is one of the most effective tools for diagnosing traumatic VSD. For patients whose echocardiography fails to provide good quality images, additional cardiac imaging modalities such as CT or MRI can play an important role [9].

Surgical repair may not be feasible immediately after injury because of patient's poor clinical condition. In addition, an increase in the defect size can result from progressive tissue necrosis due to injury of the septal coronary arteries after perforation of the interventricular septum. Delay allows time for the development of fibrotic scarring on the rims of the defect, facilitating delineation on transthoracic echocardiography, which is important for optimal device selection and fixation [10].

Percutaneous closure has been successful in children with congenital VSD, approximately 90% of which are in the perimembranous septum [11]. In most studies, the Amplatzer Muscular VSD Occluder and ASD Occluder were employed. Complete closure using the Amplatzer Muscular VSD Occluder or ASD Occluder is achieved in 92% of patients with a perimembranous VSD and in 95% of patients with a Muscular VSD [11].

The post-traumatic VSD is almost angulated, but the congenital VSD or ASD is straight. The Amplatzer muscular VSD Occluder and ASD Occluder, which have two discs, are difficult to release in an angulated pathway. However, the PDA Occluder has only one disc and therefore easy to release. Use of the PDA Occluder in a VSD closure has several advantages in comparison to the Amplatzer Muscular VSD Occluder or the ASD Occluder. The PDA Occluder cannot cause ventricular outflow tract obstruction because it only has a left disc [7].

Patent ductus arteriosus closure using the Occlutech PDA Occluder has been reported to be safe and effective in carefully selected patients [12]. Its use in the closure of post traumatic ventricular septal defects has not been widely reported in the literature.

There is no study, to the best of our knowledge that has reported on percutaneous closure of post traumatic VSD using Occlutech PDA Occluder. We report for the first time a successful closer of post traumatic VSD using Occlutech PDA Occluder.

Conclusion

Our experience indicate that percutaneous closure of the post-traumatic VSD using the Occlutech PDA Occluder device is feasible, safe and effective in carefully selected patients.

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