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Malfunction of an Oversized Amplatzer Ductal Occluder Presenting as Aortic Coarctation: A Case Report

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ABSTRACT

Introduction: This case report discusses the malfunction of an oversized Amplatzer Ductal Occluder device, which presented clinically as aortic coarctation.

Case Presentation: Patient with Patent Ductus Arteriosus (PDA) underwent treatment with the placement of an Amplatzer Ductal Occluder. Following procedure, patient presented with decreased oxygen saturation in lower extremity, up to 80%. Catheterization revealed a significant pressure difference between the proximal and distal aorta. Post-ADO placement, the proximal aortic pressure increased to 83/34 (57) mmHg, while the distal aortic pressure dropped significantly to 43/33 (38) mmHg, indicating a substantial pressure gradient caused by the oversized device.

Management: In response to the hemodynamic compromise, the patient underwent an emergency left thoracotomy for the removal of the Amplatzer device and PDA ligation. The surgical intervention was performed to address the obstruction and restore normal blood flow. Post-operatively, the patient was admitted to the Intensive Care Unit and underwent Heparinization. The patient's hemodynamics were stable and oxygen saturation levels in the lower extremities showed improvement.

Discussion: The oversized Amplatzer device likely caused an obstruction that mimicked aortic coarctation, resulting in significant hemodynamic changes. Timing of surgical intervention was crucial in preventing further complications. This case highlights the importance of accurate device sizing during PDA closure procedures to avoid such adverse outcomes.

Conclusion: Oversizing of the Amplatzer Ductal Occluder can lead to significant hemodynamic changes and clinical deterioration. Accurate sizing and prompt surgical intervention are essential in managing and preventing complications

Keywords: *Amplatzer Ductal Occluder, aortic coarctation, Patent Ductus Arteriosus, catheterization, thoracotomy.*

1. INTRODUCTION

Patent ductus arteriosus (PDA) is a congenital cardiovascular anomaly characterized by the persistence of the ductus arteriosus, a vascular connection between the pulmonary artery and aorta. Left untreated, PDA can result in significant morbidity due to left-to-right shunting and volume overload of the pulmonary circulation. Transcatheter closure of PDA using the Amplatzer Ductal Occluder (ADO) has become the standard of care due to its high efficacy and safety profile. The ADO device has a reported success rate of 97% with major procedural complications occurring in fewer than 3% of cases. However, when complications occur, particularly due to incorrect device sizing, they may result in severe hemodynamic compromise.

This case report presents an unusual instance of iatrogenic aortic coarctation following PDA closure using an oversized ADO, necessitating surgical intervention. The report aims to emphasize the importance of proper device sizing, prompt identification of complications, and timely surgical management.

Case Presentation

Patient with Patent Ductus Arteriosus (PDA) underwent treatment with the placement of an Amplatzer Ductal Occluder. Following procedure, patient presented with decreased oxygen saturation in lower extremity, up to 80%. Catheterization revealed a significant pressure difference between the proximal and distal aorta.

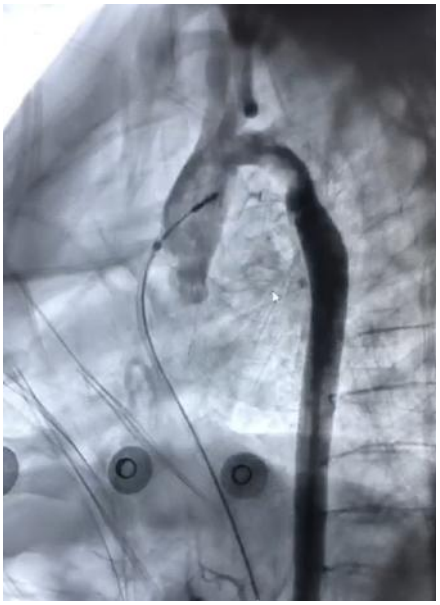

Fig 1. Significant narrowing of the proximal descending aorta, just distal to the aortic arch, caused by device obstruction

Post-ADO placement, the proximal aortic pressure increased to 83/34 (57) mmHg, while the distal aortic pressure dropped significantly to 43/33 (38) mmHg, indicating a substantial pressure gradient caused by the oversized device. Cardiac catheterization revealed a significant hemodynamic disturbance characterized by a marked narrowing of the proximal descending aorta, located just distal to the aortic arch. This obstruction was attributed to external compression exerted by the implanted Amplatzer Ductal Occluder device. The pressure gradient between the proximal and distal aorta confirmed the functional severity of the obstruction, resembling a coarctation-like physiology. These findings highlighted the device's inappropriate sizing, leading to a compromised aortic outflow tract and subsequent lower body hypoperfusion

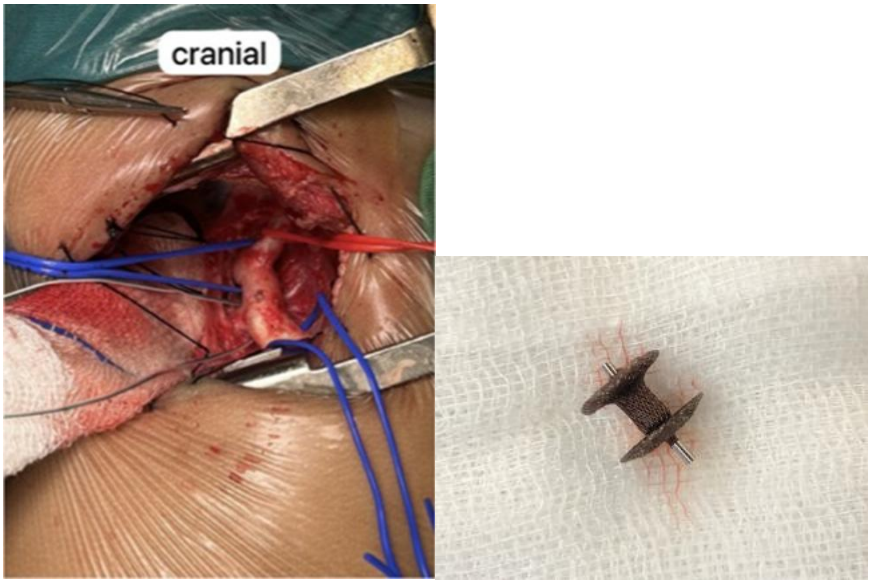

Fig 2. ADO device was extracted via surgical thoracotomy

In response to the hemodynamic compromise, the patient underwent an emergency left thoracotomy for the removal of the Amplatzer device and PDA ligation. The surgical intervention was performed to address the obstruction and restore normal blood flow.

Given the critical hemodynamic disturbance, the patient was taken to the operating theater for emergency intervention. A left thoracotomy was performed, and the ADO device was surgically extracted. The PDA was ligated to prevent residual shunting. The patient was admitted to the intensive care unit (ICU) postoperatively and initiated on intravenous heparin

therapy. Subsequent monitoring showed stabilization of hemodynamic parameters and improvement in lower extremity oxygen saturation. Clinical and laboratory parameters were gradually improved, and the patient was discharged.

2. DISCUSSION

Transcatheter closure of PDA has revolutionized the management of this congenital anomaly, offering a minimally invasive alternative to surgical ligation. The Amplatzer Ductal Occluder is one of the most commonly used devices due to its favorable profile. Nevertheless, improper selection, particularly oversizing, can lead to mechanical complications.

In this case, cardiac catheterization revealed a significant hemodynamic disturbance characterized by a marked narrowing of the proximal descending aorta, located just distal to the aortic arch. This obstruction was attributed to external compression exerted by the implanted Amplatzer Ductal Occluder device. The pressure gradient between the proximal and distal aorta confirmed the functional severity of the obstruction, resembling a coarctation-like physiology. These findings highlighted the device's inappropriate sizing, leading to a compromised aortic outflow tract and subsequent lower body hypoperfusion.

Oversized ADOs may protrude into adjacent vascular structures, including the aorta, resulting in turbulent flow patterns, endothelial injury, and even vascular compression. According to Dryżek et al. (2010), late aortic coarctation following ADO deployment is a recognized complication due to mechanical protrusion of the device. Similarly, Jang et al. (2007) described that such protrusions can lead to alterations in hemodynamic patterns and contribute to obstructive physiology requiring surgical revision.

Furthermore, Sathanandam et al. (2021) emphasize that careful imaging assessment before device deployment is crucial to prevent such complications. Device oversizing has also been linked to increased risk of erosion, thrombosis, hemolysis, and endarteritis, highlighting the need for precision in device selection (Nour et al., 2022).

Management strategies depend on the severity of symptoms and hemodynamic impact. In cases with significant gradient or end-organ hypoperfusion, immediate surgical intervention is warranted, as illustrated in our case. Device retrieval and PDA ligation via thoracotomy provided rapid resolution of obstruction and restored physiological flow.

This case underscores the need for a multidisciplinary approach and post-intervention vigilance in patients undergoing PDA closure. Early identification of complications through clinical and hemodynamic monitoring is essential to prevent adverse outcomes.

3. CONCLUSION

While rare, mechanical complications from oversized Amplatzer Ductal Occluders can result in life-threatening conditions such as iatrogenic aortic coarctation. This case underscores the critical importance of accurate device sizing and highlights the need for heightened clinical awareness post-device implantation. Prompt surgical intervention remains the definitive solution in the presence of device-induced vascular compromise.

Conflicts of interest

There are no conflicts of interest

Consent

Specific written informed consent of the patient was obtained for publication of above details and images for the purpose of medical education. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity.

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