Delayed Fracture of a PFM Nit-Occlud Flex Coil after Transcatheter Occlusion of Patent Ductus Arteriosus

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Abstract

We report the fracture of a 4×4 Nit-Occlud pfm coil in a child with patent ductus arteriosus (PDA), bicuspid aortic valve, and coarctation, detected three years after deployment without any adverse consequent. This report emphasizes the importance of adherence to the user guidelines of the company for the implementation of the device and also shows the significance of lateral chest X-ray in the follow-up of patients after the occlusion of the PDA, particularly in the case of using smaller-sized, frail pfm coils for the detection of coil fracture ***(Iranian Heart Journal 2011; 12 (1):56 -59).***

Key words: coil fracture■ patent ductus arteriosus■ coarctation

Coil occlusion of the patent ductus arteriosus (PDA) is a well-established therapeutic modality for the transcatheter closure of small PDAs. Several different types of coils are used,[1] with Nit-Occlud pfm coils being amongst the most frequently used

ones.[2] We report a hitherto unreported complication of the flexible 4×4 pfm coil, caused by the operator's technical flaw during the deployment of the coil for the closure of the PDA in a child with juxtaductal discrete coarctation, mild valvar aortic stenosis, bicuspid aortic valve (BAV), and a small PDA.

Case Report

The patient was a 4-year-old boy admitted for the evaluation of recurrent coarctation after an episode of balloon angioplasty of the coarctation and the consequent coil occlusion of the PDA at the age of one year. His physical examination was unremarkable except for a grade 3/6 systolic murmur at the left sternal border. Chest X-ray (Fig. 1) seemed to be normal at first glance; however, with more careful observation the fracture could be diagnosed retrospectively.

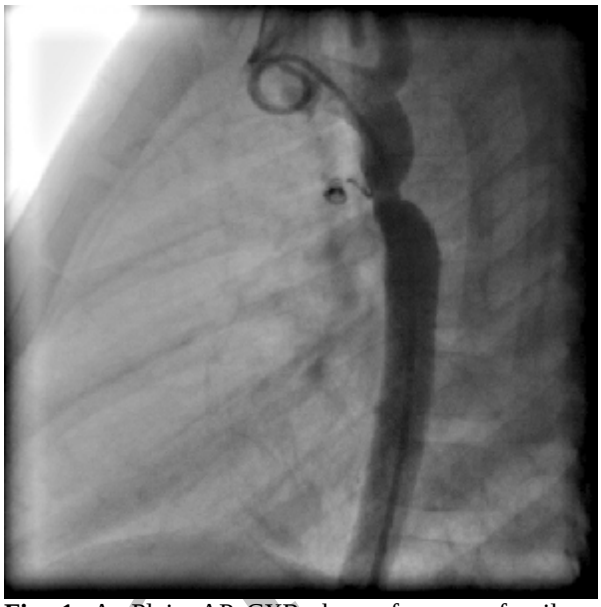

Fig. 1. A: Plain AP CXR shows fracture of coil on careful inspection; B: on AP view at cineangiography the fracture is unremarkable.

The electrocardiogram was also within the normal limits for the patient's age. He had a history of aortic balloon angioplasty using

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Cologne, Germany) introduced from the arterial approach.

Main Pressure data at two cardiac catheterizations are represented in Table I.

Chamber	2007 hemodynamic data		2010 hemodynamic data	
	First catheterization	After aortic balloon angioplasty With Numed 10 (mm) * 20(mm) balloon	Second catheterization	After 29 mm Genesis XD stent implantation
	Pressures (mmHg)		Pressures (mmHg)	
LV	150 /0-20	130/0-20	160/0-10	150/0-15
AAO	130/65(mean=85)	105/70(mean=85)	130/80(mean=96)	120/80(mean=95)
DAO	95/70(mean=85)	80/60(mean=70)	100/75(mean=85)	120/80(mean=95)

Descending aorta angiography in the lateral view revealed the fracture of the coil at the aortic end. A technical flaw in the deployment of the coil was evident. There was one loop of coil left at the aortic end and the others at the pulmonary end. Fortunately, there was no residual shunt across the

PDA, and no displacement of the two parts of the fractured coil was seen. This suggested that the coil fracture had occurred after the endothelialization of the device.
The fracture was simply overlooked on the usually-obtained anteroposterior chest X-rays for follow-up and on routine follow-up 2D echocardiography. Even the anteroposterior fluoroscopic image failed to show it (Fig. 2).

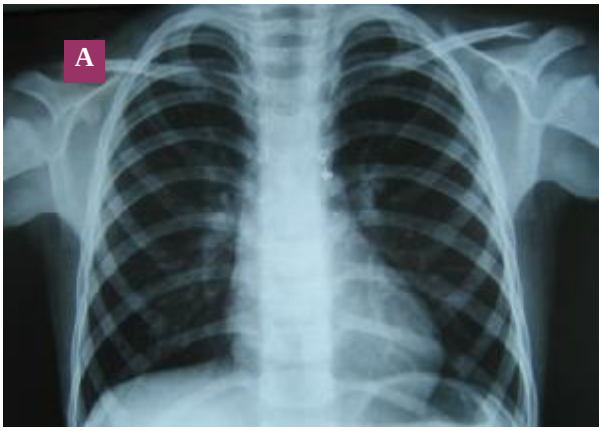
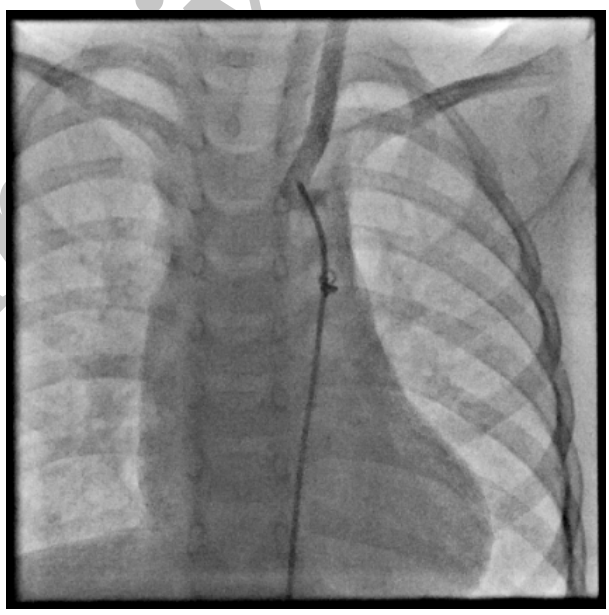


Fig. 2. Lateral angiogram clearly shows the fractured coil.

However, the lateral view clearly revealed the broken coil (Fig. 3). The patient underwent a successful coarctation stenting using a 29-mm
Palmaz Genesis XD (Abbott Laboratories, USA) mounted on a BIB of 14 mm× 40mm. After the procedure, the pressure gradient across the coarctation abolished completely (Fig. 4).

B



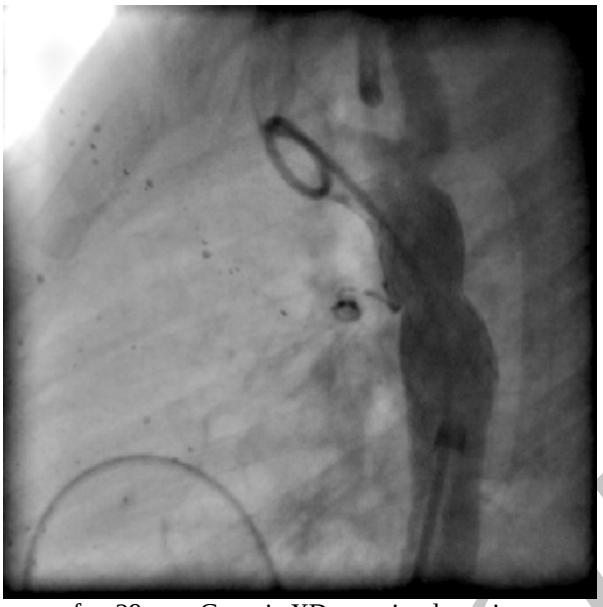


Fig. 3. Lateral descending aortogram after 29-mm Genesis XD stent implantation

Discussion

Since 2001, Nit-Occlud pfm coils have been successfully used for the closure of PDAs. These coils are premonuted, stronger, and more compact than Duct-Occlud pfm coils.[1]

Several complications have been reported following the coil occlusion of the PDA; these complications include unsatisfactory coil position in the PDA, embolization to the branch pulmonary arteries or to the descending thoracic aorta, left pulmonary artery stenosis iatrogenic coarctation, and hemolysis from residual shunt.[2,3,4] However, to the best of our knowledge, pfm coil fracture, without producing any other inadvertent complication, has not been reported before.

In our case, lack of embolization or displacement of the coil to the DAO or branch pulmonary arteries indicates that the fracture had probably happened after endothelialization. Since the degree of coil stiffness decreases from the aortal side to the pulmonary side, deployment of these coils from the aortic approach causes the more stiff part to locate in the pulmonary end and the more frail part to sit in the aortic end.

This reverse placement, in addition to the presence of coarctation, exposes the more frail part of the coil to the abnormal aortic wall mechanics. Apparently, applying more tension on the more frail part of the coil sets the stage for fracture.

This case underscores the importance of adherence to the user guidelines issued by the company, particularly for smaller and more delicate coils. The Nit-Occlud 4×4 pfm coil is a 3.5-mm flexible coil. According to the manufacturing company, after advancing the coil until the first marker M1 is positioned close to the Y-connector, all but one loop should be configured outside the implantation catheter at the aortic end. Be that as it may, in our case with the deployment of the coil from the arterial approach, two technical flaws occurred: Firstly, only one loop was held in the aortic side and secondly, the less stiff part of the coil was located in the aortic end of the PDA. The operator deliberately did so in order to prevent the exacerbation of the already present coarctation and to minimize the manipulation of the balloon–inflated coarctation segment. Chronic excessive tension on the aortic loop led to the fracture of the coil at the aortic end in our case.

The importance of this case report is twofold: Firstly, paying meticulous attention to the user instructions of the manufacturing company is critical and secondly, the need for a lateral chest X-

ray in order to detect coil fracture after the transcatheter coil occlusion of the PDA at the earliest. This is particularly applicable for the follow-up of cases with flexible 4×4 pfm coil deployment.

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