

Background:

The “unzipping” technique for pulmonary artery (PA) stenosis is utilized with undefined long term results. With unzipping, small diameter stents are implanted then dilated, longitudinally fractured and re-stented with large stents dilatable to adult PA diameters. In-vitro unzipping characteristics of commonly used stents are defined, in-vivo fracture characteristics and safety and efficacy of the unzipping technique is unknown. We compared in-vitro to in-vivo fracture characteristics and assessed the unzipping technique to adult PA diameters.

Methods:

Twelve piglets with LPA stenosis underwent the unzipping sequence at 6, 10 and 18 weeks of age. Three stents (VeriFLEX 4-4.5 mm, Genesis 5-7 mm, ParaMount 6-7 mm) were implanted followed by attempted dilation to fracture and implantation of large stents. Pre and post-unzipping angiography assessed stent and vascular morphology. In-vivo and in-vitro stent response to dilation was recorded.

Results:

In-vivo nine of twelve stents fractured. One VeriFLEX stent unzipped in an organized fashion with limited shortening, all remaining stents fractured longitudinally with variable shortening and distortion. A ParaMount 7 mm and Genesis 5 mm achieved dilated diameters greater than the distal PA without fracturing. One 4 mm VeriFLEX could not be crossed at the second procedure. There were no aneurysms or dissections with unzipping. The final diameter of the stented PA, $14 \text{ mm} \pm 1.2$, equaled the proximal PA of normals $14.7 \text{ mm} \pm 1$ ($p=0.19$). There was no difference in final PA dimensions between stent types. VeriFLEX stents fractured in-vivo at 2.3-2.7 times nominal diameter shortening 37-67% compared to in-vitro at 2 times nominal shortening 17%. Genesis stents fractured in-vivo at 2.3-2.9 times nominal shortening 20-54% compared to In-vitro at 2.5 times nominal shortening 33%. ParaMount stents fractured in-vivo at 2-2.7 times nominal shortening 20-45% compared to in-vitro at 2.8 times nominal with 23% shortening.

Conclusion:

Unzipping can be safely performed to achieve adult PA dimensions. Small diameter stents fracture in-vivo with characteristics inconsistent to in-vitro and stent types and mechanism of fracture do not alter outcomes.

