UCLA

UCLA Previously Published Works

Title

Cutting balloon ascending.

Permalink

<https://escholarship.org/uc/item/223981vv>

Journal

Catheterization and cardiovascular interventions : official journal of the Society for Cardiac Angiography & Interventions, 54(4)

ISSN

1522-1946

Author

Tobis, J

Publication Date

2001-12-01

DOI

10.1002/ccd.1315

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/4.0/>

Peer reviewed

Editorial Comment

Cutting Balloon Ascending

Jonathan Tobis, MD

Interventional Cardiology Research,
UCLA School of Medicine,
Los Angeles, California

Andreas Gruntzig recognized the paradox inherent in inflating a balloon under high pressure within an atherosclerotic artery. He cautioned that the key for a successful angioplasty was to find a way of “balancing optimally, arterial dilatation and arterial damage.” Although balloon dilatation often was successful, he realized that the results were also unpredictable because the mechanical characteristics of the plaque were variable. This could lead to excessive tearing where the plaque could be ripped from its adhesion with the media. A large dissection might occlude the lumen.

Barath et al. [1] addressed this paradox by suggesting that razor-sharp blades, bonded along the length of an angioplasty balloon, could act to score the plaque and produce a more controlled cut. There are now several studies to suggest that the initial results with the cutting balloon are superior to those obtained with balloon dilatation alone (also referred to as plain balloon dilatation)[2–4]. In the majority of cases, the subsequent deployment of a coronary artery stent makes the use of a specialized (and expensive) cutting balloon unnecessary. However, there are several situations where the use of the cutting balloon appears to offer significant technical advantages over plain balloon dilatation. First, the cutting balloon does not squeeze out of an arrowed arterial segment in a manner that has been described gastronomically as watermelon seeding. This can be a frustrating situation with plain balloon dilatation of fibrotic plaques and is especially common when treating restenotic lesions such as in-stent restenosis. The cutting balloon has shown that it is predictable in not moving from the intended target despite the presence of glistening connective tissue. Second, the cutting balloon is effective when treating ostial lesions. These are often extremely resistant to plain balloon dilatation and can also be associated with the watermelon seed effect. Third, bifurcation lesions remain a difficult subset to treat effectively with balloon dilatation or even with coronary stents. Scoring the plaque and dilating the major branch as well as the ostium of the side branch with the cutting balloon appears to provide a better initial result compared to kissing balloons or kissing stents. Since the adverse clinical event rate of placing a stent in both branches of a bifurcation is high (approximately 30%), the cutting balloon may be useful in adequately expanding the ostium of the side branch and thereby avoiding the necessity of a second stent. Fourth, heavily calcified plaque has the greatest bio-mechanical resistance of atheromatous tissues, and understandably, it is extremely resistant to balloon dilatation. Over the past decade, it became axiomatic that intensely calcified arteries should be treated with rotational atherectomy. This clever method of boring through calcium with a high-speed diamond drill produced an effective means of obtaining a

successful angioplasty result when traditional plain balloon dilatation appeared hopeless. Unfortunately, this technique is often associated with sluggish or no flow due to distal embolization and/or release of potent vasoconstrictive substances. The use of the cutting balloon has radically altered our approach to calcified lesions. As elegantly demonstrated in this issue, Karvouni et al. describe how the cutting balloon can be effective despite heavily calcified disease. In their large experience with the cutting balloon (432 lesions), they identified 37 lesions with angiographic moderate or severe calcification. The results are impressive, especially in this subset of lesions that are at high risk for complications. The in-hospital MACE was only 10.3%, without any ruptures reported due to the cutting balloon. The follow-up MACE of 10.3% is even more revealing, with only two episodes of target lesion revascularization (7%). Despite their convoluted discussion of the theoretic differences between the acute gain obtained by a cutting balloon versus a plain balloon of the same size, the fact remains that predilatation is probably only necessary in a small percentage of cases where the rigid cutting balloon cannot be advanced initially. The consequence of these successful results with the cutting balloon in calcified lesions is that the use of rotational atherectomy has plummeted in laboratories that are now familiar with the cutting balloon. At UCLA, the use of rotational atherectomy dropped from 12% to 0% of cases after the cutting balloon became available. The incidence of the no-reflow phenomenon has also been reduced. Although the study by Karvouni et al. was not a randomized trial, the positive experience clearly demonstrates that heavily calcified stenoses can be effectively treated with the cutting balloon and do not a priori require rotational atherectomy. Similar to our experience with the excimer laser, I suspect that, in the future, rotational atherectomy will be used rarely, if at all.

REFERENCES

1. Barath P, Fishbein MC, Vari S, Forrester JS. Cutting balloon: a novel approach to percutaneous angioplasty. *Am J Cardiol* 1991;68:1249–1252.
2. Okura H, Hayase M, Hosokawa H, Suzuki T, Yamaguchi T, Yock PG, Fitzgerald PJ. Acute lumen gain after cutting balloon angioplasty in calcified and non-calcified lesions: intravascular ultra-sound analysis of the REDUCE study. *J Am Coll Cardiol* 1999;33:101A.
3. Muramatsu T, Tsukahara R, Ho M, Shigeki I, Inoue T, Akimoto T, Hirano K. Efficacy of cutting balloon angioplasty for lesions at the ostium of the coronary arteries. *J Invas Cardiol* 1999;11:201–206.
4. Izumi M, Tsuchikane E, Funamoto M, Otsuji S, Tateyama H, Kabayashi T, Awata N. One year clinical and three-month angiographic follow-up of cutting balloon angioplasty vs. plain old balloon angioplasty randomized study in small coronary arteries (CAPAS). *J Am Coll Cardiol* 1999;33:47A.