

Stent Geometry During Inflation Influences Later Restenosis

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We sought to determine whether intimal hyperplasia provoked by stents stem from injury imposed by stent expansion characteristics.

Rabbit femoral arteries were exposed and an indelible grid applied *in-vivo* to the exterior wall. To allow dynamic measurement of changing arterial dimensions, magnified video images of the grid were then digitized in a serial fashion during stent expansion 8 atm.

The proximal and distal ends of the expanding balloon, unconstrained by the shorter stent, inflated first at 4 atm, causing the overlying stent to open nonuniformly into a dumbbell shape. The center of the stent opened with increasing pressure, contracting along its axis and causing the already-inflated proximal and distal regions to scrape the intima longitudinally inwards. *En-face* histologic examination of these arteries revealed a pattern of acute scraping deendothelization at the ends. These areas correlated well with injury scores and 14 day intimal hyperplasia (table).

The magnitude of these effects depend upon stent geometry. Expansion of slotted tube stents had a 14% greater nonuniformity at 4 atm and a 48% greater axial contraction than corrugated ring stents, corresponding to a 71% larger injury score and 61% greater intimal hyperplasia.

Conclusions: 1) Stent expansion is nonuniform, which 2) produces vascular injury that varies with stent geometry. 3) This mechanism of injury is a determinant of stent restenosis.

	proximal end	mid stent	distal end
% expansion at 4 atm	42±8	29±8	42±8
injury score	.18±.06	.11±.02	.25±.04
14 day intimal area (mm ²)	.83±.11	.52±.05	.70±.11