

PHOTODYNAMIC THERAPY INHIBITS ENDOTHELIAL HYPERPLASIA AFTER BALLOON INJURY

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BACKGROUND: Restenosis after percutaneous angioplasty (PA) may develop in previous lesions after 4 to 6 months. Mostly, its histological basis is injury-related intimal hyperplasia (IH). Even with drug-eluting stents, IH still could not be eliminated completely and would lead to at least 5% of RS rate.

In this study, we used photodynamic therapy (PDT), which inhibits cell proliferation and had been used for treating cancer effectively, to test whether PDT could inhibit IH in the rabbit femoral artery balloon injury model.

METHOD: We used 10 New Zealand rabbits weighing 3 to 4 kg. Photophrin (2mg/kg) was injected intramuscularly 48 hours before the procedure. For each rabbit, bilateral femoral arteries were dilated with a monorail balloon catheter with an outer diameter of 2 mm up to 14 ATM for 60 seconds, after which one of the arteries were chosen for PDT.

The other side of the same rabbit was preserved well to be an internal control. Through an optic fiber with an outer diameter of 425 um and a length of 25 mm, a 630-nm laser beam was emitted over the lesion just dilated (2000 mW for 70 seconds to achieve 100 J/cm²). The vessels were repaired with 7-0 prolene to ensure distal patency. The animal was sacrificed 21 days after the procedure and bilateral femoral arteries were dissected, isolated, fixed, and then stained. Under 200-fold magnification, cross sections of the lesion were checked to assess the IH. The distance ratio of “endothelium (ET)-internal elastic membrane (IEM)” to “endothelium- adventitia (AD)” (ET-IEM/ET-AD) was measured for each section.

RESULT: Four rabbits died during the procedure and another was lost in the third week. Among the rest, two showed distal occlusion of the vessels and were excluded from further analysis to avoid bias. The laser-treated sides showed significantly lower ET-IEM/ET-AD than the control sides as shown by the figure below.

CONCLUSION: PDT with photophrin can inhibit IH of vessels effectively after balloon injury.

Keyword: Percutaneous balloon angioplasty, restenosis, photodynamic therapy