

:  
 가  
 : 1 × 1cm 316L (600 μm )  
 polyhydroxyethylmethacrylate tresyl activation  
 Adhesive peptide Gly-Arg-Gly-Asp-Tyr Gly-Arg-Glu-Asp-Val-Tyr  
 covalently link ( ×200)  
 (collagen gel)  
 10  
 ,  
 :  
 (P < 0.000)  
 RGD peptide 가  
 (P < 0.05) Peptide REDV peptide가  
 :  
 가 가 HAEC REDV peptide  
 , Elastic Recoil  
 (Restenosis) 가  
 가  
 가  
 Adhesive Peptide  
 가  
 g/ml Epidermal growth factor 50 μg/ml Fibroblast Growth  
 factor-basic (FGF-b) MCDB-131 (Sigma,  
 U.S.A.) 가 5% CO<sub>2</sub> 37  
 316L 1 × 1cm (600 μm  
 ) (2 × 10<sup>-1</sup> mbar) EMS 100 (Electron  
 Microscopic Science, England) 가  
 20 mA  
 (Surface Tension)

(Fig. 1).

1% Polyhydroxyethyl-

(Human Aortic Endothelial Cell, methacrylate (Poly HEMA)  
 HAEC) 10% Bovine calf serum (Hyclone) 120IU/ml 200 μl pyridine 100 μl tresyl chloride 1ml dioxan  
 penicillin, 120 μg/ml streptomycin, 1 μg/ml hydrocortisone, 10 μ 10 Tresyl Activation 1mM HCl  
 PH 10 0.2M NaHCO<sub>3</sub>

Peptide (Coupling) 20 Adhesion  
 Asp-Tyr(GRGDY)(Biosynthesis, Lewisville, U.S.A.) Gly-Arg-Gly-  
 Gly-Asp-Val-Tyr(GREDVY) (Biosynthesis, Lewisville,U.S.A.)  
 , 0.8M -Mercaptoethanol  
 . HAEC  
 90 4mg/ml Albumin D-  
 MEM 24 Well Culture Plate 1mL

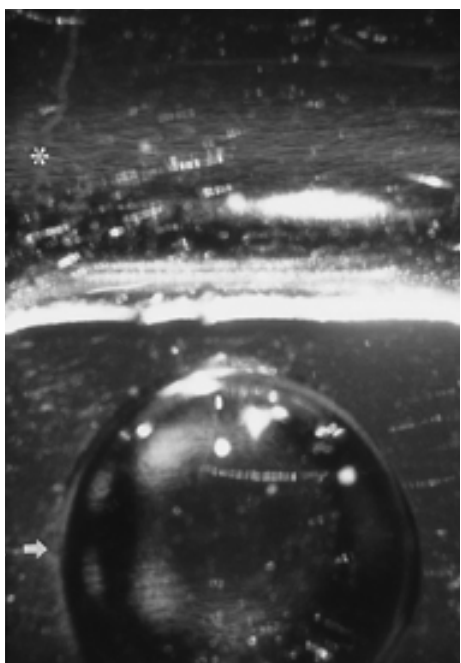
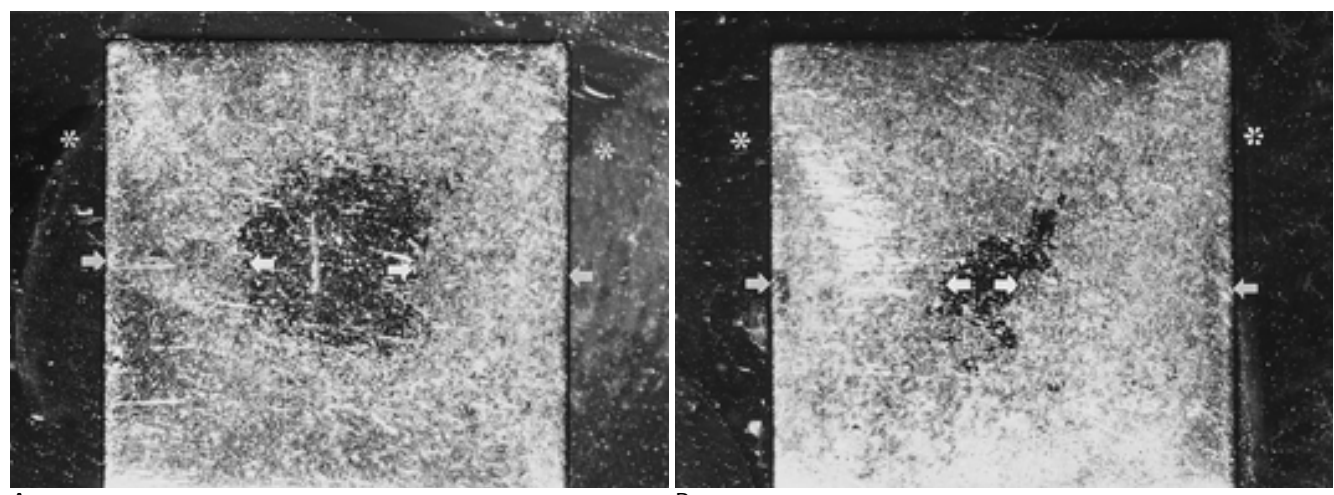


Fig. 1. Shape of Water Droplet on the Metallic Coupon  
 The even spread of a drop of water on the glow discharged up-  
 per half of the metal(\*) contrasted to the maintenance of form  
 of the water drop on the non-glow discharged lower half( ).

HAEC 37 4  
 Giemsa (x200)  
 . HAEC 30% Ammonium Chloride  
 HAEC가 (type I, rat-tail)  
 10 37  
 (x200)  
 Mann-Whitney Test  
 Giemsa  
 가 가  
 (Fig. 2 A,  
 B).  
 (Contact Angle) (Solid Surface)  
 ( Tangent Angle )  
 (Surface  
 Tension) VCA-2000XE system (AST prod-  
 uct, Billerica, U.S.A.)  
 (P< 0.000),  
 (Coating)  
 Discharge) (Positive Glow  
 가 (Negative Glow Discharge)  
 (Fig. 3).

10 HAEC GREDVY  
 Peptide Peptide 가  
 (P<0.05) Peptide Peptide



A  
 Fig. 2. A. HAEC Migration on Non-treated Stent Material  
 B. HAEC Migration on Positive Glow Discharged and GREDVY Graft Stent Material. Gray color( , ) represents migratory dis-  
 tance of HAEC on stent material from collagen gel(\*).

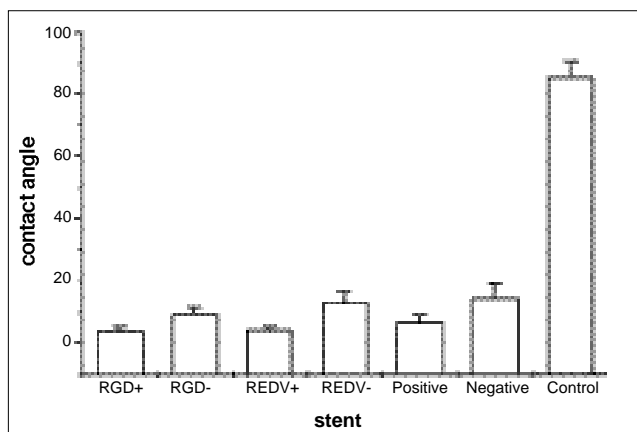


Fig. 3. Contact Angle After Glow Discharge and Surface Modification of Stent Material (REDV+, RGD+, REDV-, RGD-; Positive or Negative Discharge with Peptide Link) (Positive, Negative ; Glow Discharge Treatment without Peptide Link)

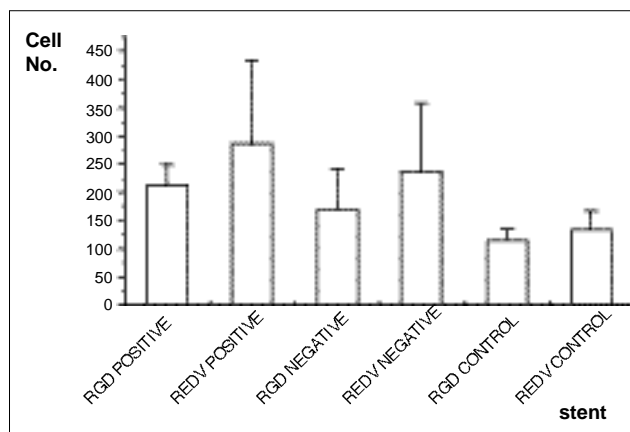


Fig. 5. Cell Adhesion Rate After Surface Modification RGD or REDV; Adhesive Peptide Positive or Negative; Method of Glow Discharge Treatment RGD or REDV control ; No growth discharge

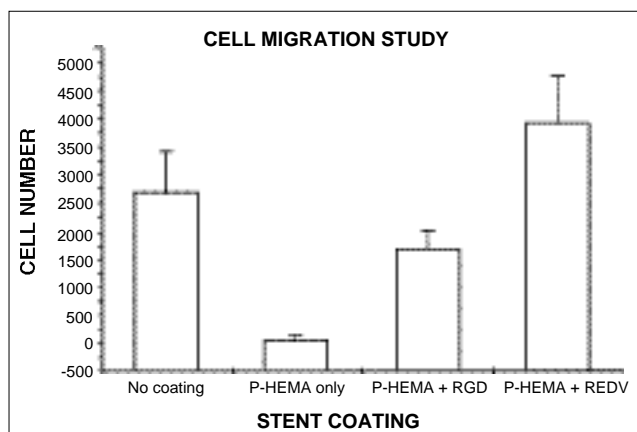


Fig. 4. Cell Number After 10 day Migration on Stent without Glow Discharge Treatment PHEMA+ GREDVY or GRGDY ; Peptide Coated Stent Material PHEMA Only ; Non Peptide Coated Stent No Coating ; Pure Metal (316 L)

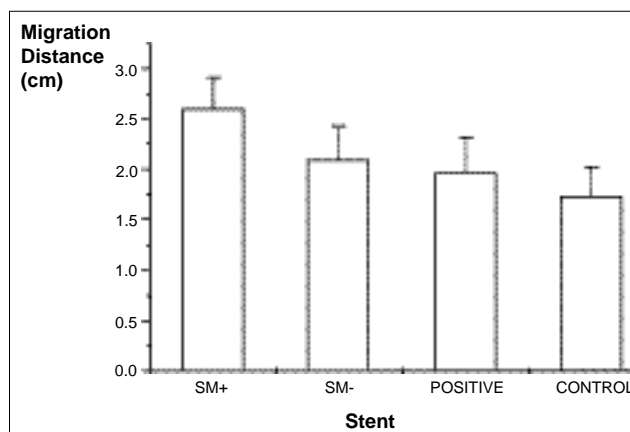


Fig. 6. HACE Migration Distance on GREDVY Graft Stent Material (SM+ ; Surface Modification with Positive Glow Discharge) (SM- ; Surface Modification with Negative Glow Discharge) (Positive ; Only Positive Glow Discharge) (Control ; No Treatment)

(Fig. 4).

Polymer

Peptide

( $P < 0.05$ ), GREDVY

가

GRGDY

(Fig. 5).

HAEC

GREDVY Peptide

(SM<sup>+</sup>, SM<sup>-</sup>)

)

Peptide

(Positive )

10

HAEC

가

( $P < 0.05$ ) (Fig. 6).

GREDVY

가

HAEC

( $P < 0.05$ ).

가

(Endothelin derived relaxing factor), prostacyclin Heparin sulfate

가 (1) RGD Tripeptide Sequence

가 (Growth Tetrapeptide Sequence REDV

factor) 가 (Growth Tetrapeptide Sequence REDV

가 RGD RGD (12,14-16), Peptide Protein Desorp-tion REDV REDV가 Proteinase (Cellular Proteolysis)

가 (3,4).

가 (Net Electrical Charge) Fibrin Film-Coated Stent가

Tantalum (17,18), Fluorine-Acryl-Stylene-Urethane-Silicone Coating (19),

(5). 5-20nm (Fibrinogen) Silicone-Carbide-Coated Palmaz-Schatz Stent Poly-Lactic Acid 가 (20,21), Peptide

(Wettability) 가 PHEMA Peptide

(6). Covalently link PHEMA REDV peptide

20-30dynes/cm (7) (Scanning Electron Microscopy)

24 가 (2).

가

가 (8-10). PHEMA Hydrogel

(Cell-Substrantum Interaction)

가 (9,11).

가 Fibronection Vitronectin Adhesion- Promot-ing Peptide가 Peptide 가 Covalently Link PHEMA

(12,13).

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## **Surface Modification of Stent Material : Experimental Study of Adhesion and Migration of Human Aortic Endothelial Cells on Stent Material<sup>1</sup>**

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**Purpose :** To evaluate the relative adhesion and migration rate of cultured human aortic endothelial cells on to modified stent material in vitro.

**Materials and Methods :** Flat 1 × 1 cm square, stainless steel 316 L pieces (600 μm thick) were initially glow discharged to increase the polarity of the metal and were coated with 1 % polyhydroxyethylmethacrylate to which two different amino acid peptide sequences (GRGDY, GREDVY) were covalently linked via an amide to an amino-terminus, thus providing a known orientation of these covalently bound peptides. To stimulate implantation of a stent onto the intact arterial wall, human aortic endothelial cells were seeded and grown to confluence on thick, firm collagen gel. The peptide coated steel pieces were then implanted on this endothelialized surface and migration of HAEC to the surface was monitored and measured for ten days. The contact angle of steel was measured before and after glow-discharge treatment.

**Results :** Our results indicate that the migration and adhesion rate of HAEC to surfaces bearing either GRGDY or GREDVY adhesive peptide sequences was significantly higher than that of uncoated stainless steel. The contact angles of glow-discharged steel (either positive or negative charge) were significantly lower, and this indicates the increased wettability of steel. Furthermore, migration to a GREDVY-coated surface was greater than to one coated with GRGDY.

**Conclusion :** These results indicate that a specific peptide sequence (GREDVY), together with positive glow-discharge treatment of steel can selectively enhance endothelial cell migration to metallic stent material.

**Index words :** Stents and prostheses

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