

Supporting Information

Defining Injectability of Transcatheter Embolic Materials *via* Work of Injection: Correlation with Viscosity-Rise Temperature and User-Centered Performance Metrics

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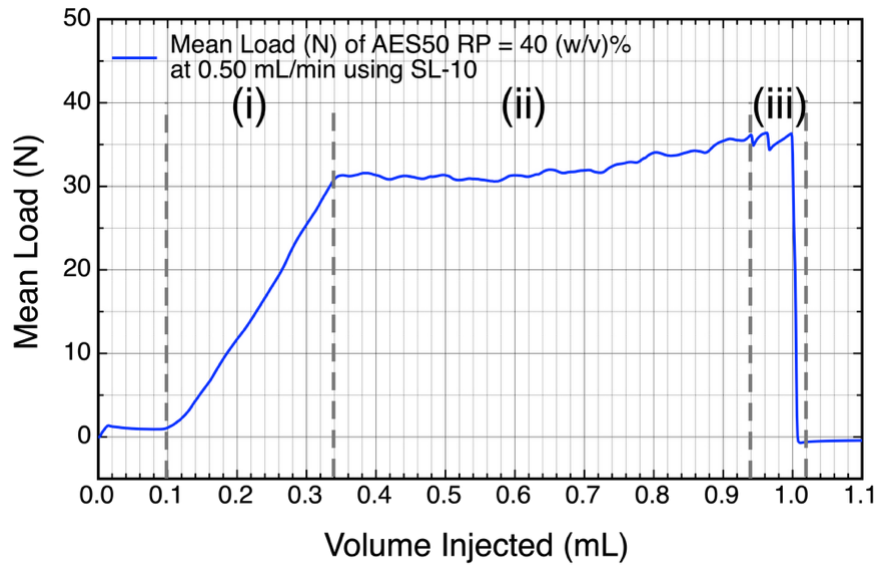


Figure S1. Original definition of the force curve phase. An example case of mechanical injection force curve using AES50 RP = 40 (w/v)% at an injection rate of 0.50 mL/min and Excelsior SL10 microcatheter. The injection force curves typically showed the following three phases: (i) a mostly linear increase in load, where the material came out from the catheter tip; (ii) a change in slope to continue the material extrusion; and (iii) the extrusion-completion, where a peak load was observed before a steep decrease in the force.

Table S1. Statistical parameters from the experimental results.

Plot Color	Figure number	Injection Rate (mL/min)	Setup	Indicator	Variable	Injection Type (*1)	size (n), each	p value, min. (*2)	p value, max.	coefficient (R ²)	max, p < 0.05	max, p < 0.01
Red	3, inset (left)	0.25	$V_{inj} = 0.50$ mL	W_{inj} (N·mL)	Cath. tip ID (μ m)	Mech.	3	1.58E-03	4.52E-02	0.999**	*	
Red	3, inset (left)	0.50	$V_{inj} = 0.50$ mL	W_{inj} (N·mL)	Cath. tip ID (μ m)	Mech.	3	1.43E-05	5.10E-05	0.783	*	**
Red/Blue	3, inset (left)	0.25/0.50	$V_{inj} = 0.50$ mL	W_{inj} (N·mL)	Injection rate (mL/min)	Mech.	3/3	1.46E-06	1.76E-02	N/A	*	
Blue	3, inset (right)	0.25	$V_{inj} = 0.98$ mL	W_{inj} (N·mL)	Cath. tip ID (μ m)	Mech.	3	1.86E-04	2.61E-02	0.947	*	
Blue	3, inset (right)	0.50	$V_{inj} = 0.98$ mL	W_{inj} (N·mL)	Cath. tip ID (μ m)	Mech.	3	4.49E-05	3.89E-03	0.974	*	**
Red/Blue	3, inset (right)	0.25/0.50	$V_{inj} = 0.98$ mL	W_{inj} (N·mL)	Injection rate (mL/min)	Mech.	3/3	1.22E-04	7.37E-04	N/A	*	**
Red	4a	All	cath. = Marathon TM AES30, RP = 40 (w/v)%	W_{inj} (N·mL)	Injection rate (mL/min)	Mech.	3	1.62E-03	2.67E-01	0.963		
Blue	4a	All	cath. = Marathon TM AES40, RP = 40 (w/v)%	W_{inj} (N·mL)	Injection rate (mL/min)	Mech.	3	7.26E-04	1.07E-01	0.893		
Red	4b	All	cath. = Excelsior SL10 TM , AES30, RP = 40 (w/v)%	W_{inj} (N·mL)	Injection rate (mL/min)	Mech.	3	4.96E-03	6.23E-02	0.980*		
Blue	4b	All	cath. = Excelsior SL10 TM , AES40, RP = 40 (w/v)%	W_{inj} (N·mL)	Injection rate (mL/min)	Mech.	3	1.86E-02	2.73E-01	0.983*		
Green	4b	All	cath. = Excelsior SL10 TM , AES50, RP = 40 (w/v)%	W_{inj} (N·mL)	Injection rate (mL/min)	Mech.	3	3.35E-02	1.83E-01	0.976		
Red	4c	0.25	cath. = Marathon TM	W_{inj} (N·mL)	AESs RP = 40 (w/v)%	Mech.	3	3.08E-04	1.09E-02	0.922*	*	
Blue	4c	0.50	cath. = Marathon TM	W_{inj} (N·mL)	AESs RP = 40 (w/v)%	Mech.	3	2.39E-04	4.43E-04	1.000**	*	**
Red	4d	0.25	cath. = Excelsior SL10 TM	W_{inj} (N·mL)	AESs RP = 40 (w/v)%	Mech.	3	1.71E-04	3.59E-02	1.000**	*	
Blue	4d	0.50	cath. = Excelsior SL10 TM	W_{inj} (N·mL)	AESs RP = 40 (w/v)%	Mech.	3	1.90E-03	7.73E-02	0.907		
Green	4d	0.75	cath. = Excelsior SL10 TM	W_{inj} (N·mL)	AESs RP = 40 (w/v)%	Mech.	3	6.32E-03	1.12E-02	0.986*	*	
Purple	4d	1.00	cath. = Excelsior SL10 TM	W_{inj} (N·mL)	AESs RP = 40 (w/v)%	Mech.	3	1.58E-02	7.83E-02	0.981*		
Red	5d	0.25	cath. = Marathon TM	W_{inj} (N·mL)	VRT	Mech.	3	3.08E-04	1.09E-02	0.999**	*	
Blue	5d	0.50	cath. = Marathon TM	W_{inj} (N·mL)	VRT	Mech.	3	2.39E-04	4.43E-04	0.915	*	**
Red	5d	0.25	cath. = Excelsior SL10 TM	W_{inj} (N·mL)	VRT	Mech.	3	1.71E-04	3.59E-02	0.906	*	
Blue	5d	0.50	cath. = Excelsior SL10 TM	W_{inj} (N·mL)	VRT	Mech.	3	1.90E-03	7.73E-02	1.000**		
Green	5d	0.75	cath. = Excelsior SL10 TM	W_{inj} (N·mL)	VRT	Mech.	3	6.32E-03	1.12E-02	0.964	*	

Purple	5d	1.00	cath. = Excelsior SL10™	W_{inj} (N·mL)	VRT	Mech.	3	1.58E-02	7.83E-02	0.972
N/A	7a-7e	N/A	cath. = Excelsior SL10™, First cast-tip contact	W_{inj} (N·min)	VRT	Hand	5 (total)	N/A	N/A	0.942
N/A	7a-7e	N/A	cath. = Excelsior SL10™, Second cast-tip contact	W_{inj} (N·min)	VRT	Hand	5 (total)	N/A	N/A	0.983*
N/A	7a-7e	N/A	cath. = Excelsior SL10™, after reflux	W_{inj} (N·min)	VRT	Hand	5 (total)	N/A	N/A	1.000**

(*1) Mech., mechanical injection; (*2) t -test p values of the data points within one data series (one variable); R^2 , liner regression coefficient of the indicator versus variable, * ≥ 0.980 , ** ≥ 0.990 ; N/A, not applicable.