Adherence to Early Postoperative Bridging Anticoagulation Protocols Is Linked to Degree of Clinical Compromise

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INTRODUCTION

Early post-operative parenteral bridging anticoagulation has been identified as a key component in care pathways to prevent LVAS pump thrombosis.[1] We conducted a single-center analysis of initial postoperative anticoagulation practices to identify barriers to implementation of standard anticoagulation protocols following LVAS.

OBJECTIVES

- Describe early post-operative anticoagulation practices following HeartMate (HM) II implant from 2009-2014.
- Determine patient characteristics and clinical management factors associated with specific anticoagulation practices following HM II implant.
- Identify gaps in post-op anticoagulation and key team members to help implement standard anticoagulation protocols follow LVAS implementation to help prevent pump thrombosis.

METHODS

Data were collected on 105 consecutive primary HM II LVAS recipients at a single center from 2009-14.[2] Immediate post-implantation anticoagulation was characterized in relation to standardized protocol recommended by the manufacturer, which specified early use of intravenous heparin until the INR is therapeutic along with aspirin.[3] Frequency of parenteral bridging anticoagulation; use of early bridging (≤3 days post-implant), and achievement of therapeutic bridging (PTT at target each of first 3 days) were analyzed.

RESULTS

Overall, 73 (70%) of patients were treated with a parenteral anticoagulation bridge following device implantation and 32 (30%) received unopposed warfarin. Only 50 (48%) received an early bridge with 29 (28%) achieving an early therapeutic bridge. Initial parenteral anticoagulant was unfractionated heparin 75% and bivalirudin for 25% of patients, with median time to bridge initiation of 3 days (range 1-7). Patients receiving a parenteral bridge had lower INTERMACS profile (p=0.04) and longer intensive care unit length of stay (p<0.01). There was no difference in red cell transfusion rate or reoperation by bridging status.

Table 1. Baseline Characteristics

Characteristic	n=105
Age at time of implant (yrs)	56 ± 13
Male	85 (81%)
BMI (kg/m2)	26.9 ± 5.5
Implant strategy	
Bridge to transplantation	49 (47%)
Bridge to candidacy	16 (15%)
Destination therapy	40 (38%)
Ischemic etiology of heart failure	47 (45%)
Diabetes	43 (41%)
Cardiovascular comorbidities	
Prior MI/PCI	45 (43%)
Prior stroke or TIA	17 (16%)
Atrial fibrillation/flutter	60 (57%)
Thromboembolic history	
Prior venous thromboembolism	20 (19%)
Prior LV thrombus	22 (21%)
Prior LA thrombus	8 (8%)
CHA2DS2-VASc score	3.2 ± 1.5
Prior cardiac surgery	29 (28%)
Chronic kidney disease	46 (44%)
INTERMACS profile	
1	9 (9%)
2	63 (60%)
3	21 (20%)
4	12 (11%)
Creatinine (mg/dL)	1.4 ± 0.5
Mechanical ventilation	5 (5%)
Inotropic support	88 (84%)
Temporary MCS	29 (28%)
CPB time (min)	130 ± 73
ICU length of stay (days)	7 (5,12)
Pump speed at discharge (rpm)	9265 ± 413

Continuous variables presented as mean ± SD or median (Q1,Q3)

Table 2. Comparisons of clinical variables and frequency of pump thrombosis according to type of initial post-operative parenteral anticoagulation bridge

	Any Bridge (n=73)		Early (n=50)		Therapeutic (n=38)		Early Therapeutic (n=29)	
	No. (%) or Median (range)	*p*	No. (%) or Median (range)	*p*	No. (%) or Median (range)	*p*	No. (%) or Median (range)	*p*
Prior cardiac surgery (n=76)	52 (71)	0.81	35 (70)	0.67	26 (68)	0.50	19 (66)	0.34
INTERMACS profile[2]		0.04		<0.01		0.05		0.03
1	7 (10)		7 (14)		2 (5)		2 (7)	
2	48 (66)		35 (70)		27 (71)		21 (72)	
3	9 (12)		3 (6)		3 (8)		1 (3)	
4	9 (12)		5 (10)		6 (16)		5 (17)	
CPB time (min)	121 (24-442)	0.87	118 (26-442)	0.86	120 (24-432)	0.91	120 (26-432)	0.85
ICU length of stay	9 (2-84)	<0.01	8 (2-84)	0.30	8 (4-84)	0.47	8 (4-84)	0.42
Delayed chest closure (n=35)	29 (72)	0.17	19 (76)	0.25	12 (63)	0.76	10 (67)	1.0
Time to reoperation (days)	2 (0-26)	0.39	2 (0-21)	0.14	3 (1-21)	0.42	3 (1-21)	0.43
RBC transfusion (n=35)	28 (38)	0.12	16 (32)	0.84	14 (37)	0.67	20 (69)	0.82
Time to RBC (days)	1 (1-31)	0.06	1 (1-31)	0.65	1 (1-9)	0.16	1 (1-9)	0.43
All confirmed pump thrombosis (n=25)	19 (26)	0.47	13 (26)	0.65	8 (21)	0.81	7 (24)	1.0
Early confirmed pump thrombosis (n=14)	10 (14)	1.0	7 (14)	1.0	3 (8)	0.25	3 (10)	0.75

P-values are for comparisons between patient cohorts that did and did not receive the type of parenteral bridge indicated (data from each corresponding cohort not shown).
Abbreviations: MCS, mechanical circulatory support; *INTERMACS profile*, Interagency Registry for Mechanically Assisted Circulatory Support; *CPB*, cardiopulmonary bypass; *ICU*, intensive care unit; *RBC*, red blood cell

CONCLUSIONS

- There was only 70% adherence to post-operative bridging anticoagulation in this real-world analysis, validating the common clinical tension between preventing thromboembolism and risk of bleeding in this complex post-operative population.
- Use of parenteral bridging was more common in patients with indices of more severe clinical compromise.
- Integrating team members focused on hemostasis and antithrombotic stewardship may bridge gaps in early anticoagulation management following LVAS.

References
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Disclosures

There are no relevant financial relationships to disclose.