Arterialization of Plantar Venous System via Vein Graft:
A New Technique for Reconstruction of Heel Pad Degloving Injuries

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Purpose: Patients with heel pad degloving injury frequently develop ischemic necrosis of the area, necessitating soft-tissue reconstruction surgery. We developed a technique for arterialization of the plantar venous system via vein graft (APV) as the primary revascularization treatment. The objective of this study was to clarify the utility of APV for preservation of degloved heel pads, and the impact of this preservation on clinical outcomes.

Methods: Ten consecutive cases of degloving injury with devascularized heel pad were treated at a single trauma center from 2008 to 2018. Five cases underwent APV and 5 underwent conventional primary suture (PS) as the initial treatment. We evaluated the course according to the frequency of heel pad preservation and outcomes using the Foot and Ankle Disability Index score (FADI) at the time of last follow-up.

Results: Among the 5 cases that underwent APV, the heel pad was preserved in 3. All cases that underwent PS developed necrosis of the heel pad, requiring skin graft in 2 cases, flap surgery in 3. Both skin graft cases and 1 free flap case developed plantar ulcers. The 3 cases with preserved heel pad exhibited higher FADI compared to those that developed necrosis.

Conclusion: APV showed a relatively high likelihood of preserving the heel pad, which otherwise was uniformly lacking. Functional outcomes were improved in cases with preserved heel pad compared to those that developed necrosis and underwent additional tissue reconstruction.

TECHNICAL TRICKS AND TIPS

Case	Fracture treatment	1st intervention to HP degloving	Initial bleeding from HP	Initial CRT of HP	Time to 1st intervention (hours)	HP necorosis	Additional intervention	Time to additional intervention (days)	Postoperative complication	FADI	Follow-up period (mo)
1	N/A	APV	+	delayed(2-3sec)	18	-	-	N/A	minor infection	**96.2**	36
2	OS	APV	+	delayed(4-5sec)	10	-	-	N/A	-	**95.2**	26
3	OS(lisflanc joint)	APV	+	delayed(2-3sec)	24.5	-	LD(dorsal foot)	21	deformity of lisfranc joint	**87.5**	16
4	OS(medial column, calcaneus) amputation(lateral column)	APV	+	delayed(10sec)	6.5	+	LD(dorsal foot) Scapla(plantar) RSA(heel pad)	14 / 48	HP necrosis after APV	**27.9**	8
5	OS(calcaneus)	APV	+	delayed(2-3sec)	32.5	+	RSA(heel pad)	16	HP necrosis after APV	**78.8**	18
6	OS	PS	N.I.	N.I.	4	+	STSG	51	ulcer, bleeding	**53.8**	105
7	OS	PS	+	N.I.	3.5	+	TAP	17	-	**57.7**	68
8	N/A	PS	+	N.I.	4	+	ALT	21	-	**74**	20
9	NOM	PS	+	N.I.	5	+	LD	28	ulcer	**59.6**	19
10	N/A	PS	+	delayed(2-3sec)	2	+	RSA(heel pad)	47	-	**68.3**	10

Abbreviations: ALT: free anterolateral thigh perforator flap, APV: arterialization of planter venous system, CRT: capillary refilling time, FADI: The Foot and Ankle Disability Index score, HP: heel pad, LD: free latissimus dorsi flap, mo: month, N/A: not applicable
N.I.: not indicated medical record, NOM: non operative management, OS: osteosynthesis, RSA: reverse flow sural artery flap, STSG: split thickness skin graft, TAP: free thoracic artery perforator flap