

## Biomechanical Strength Comparison of Unidirectional and Bidirectional Barbed Wound Closure Devices in Dermal Incisions

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**Statement of Purpose:** Historically, wounds have been primarily closed using sutures secured with knots. Complications reported in standard cosmetic skin closures include knot extrusion, tissue distortion, and dehiscence. Incisional dehiscence has been attributed to tissue failure, knot slippage or suture breakage (Rashid R. Arch Dermatol. 2007;143:869-872). In the case of suture failure, the most common occurrence is breakage of the suture at the knot as stresses are concentrated at this point (Thacker JG. Am J Surg. 1975;130:374-380.). Recently, two different barbed suture devices have become commercially available that alleviate the need for knots to engender security in primary wound closures, thereby potentially negating complications associated with standard skin closures. V-Loc™ 180 device (Covidien, North Haven, CT) is a unidirectional barbed device that uses a proprietary loop end effector and allows wound closure using standard suturing techniques. Quill™ SRS PDO is a bidirectional barbed suture with two needles that requires the wound to be closed from the middle of the incision outwards to the commissures of the wound.

The objective of this study was to compare the biomechanical strength of two barbed suture devices (V-Loc™ 180 device and Quill™ SRS PDO) following primary cosmetic skin closures in a porcine dermal model.

**Methods:** Under aseptic conditions four (4) 6 cm long full thickness skin incisions were created in the sub-lumbar region along either side of the dorsal midline in 35-40 kg Yorkshire-Landrace pigs for a total of eight incisions per animal. The incisions were closed with size 3-0 V-Loc™ 180 device or size 2-0 Quill™ SRS PDO in randomized fashion using a continuous intradermal pattern in accordance to the manufacturer's instructions for use. Animals were sacrificed at days 3, 7, 14, and 28. Before sacrifice, all pigs were re-anesthetized and 4 additional skin incisions were created to provide T0 biomechanical data. Immediately after euthanasia the dermal incisions were harvested for biomechanical testing on a Zwick-Roell model BDO-FBO.5TS universal tester. The samples were mounted in flat grips (85 psi) and load was applied perpendicularly to the incisions at 40 mm per minute until failure. Peak load at failure (kgf) was recorded.

**Results:** Wounds closed with V-Loc™ 180 device were stronger than Quill™ SRS PDO at Day 0, 3, 7, and 14 with these differences being significant (p<0.05) at Days 3 and 7.

		Average Maximum Load (kgf)	Standard Deviation	Statistical p-value
0 Day	V-Loc™	13.39	3.94	0.06
	Quill™	11.05	2.65	
3 Day	V-Loc™	13.53	2.87	0.002*
	Quill™	10.38	2.3	
7 Day	V-Loc™	10.39	2.4	0.001*
	Quill™	7.56	2.11	
14 Day	V-Loc™	23.88	5.3	0.805
	Quill™	23.44	4.74	
28 Day	V-Loc™	42.45	8.96	0.757
	Quill™	43.38	7.73	

Figure 1. Average Maximum Load and Statistical P-Value

Throughout the duration of the study none of the wounds dehiscenced nor was there any suture extrusion or tissue distortion in any of the wounds.

**Conclusions:** During the critical phases of wound healing size 3-0 V-Loc™ 180 device was stronger than size 2-0 Quill™ SRS PDO with the biomechanical strength differences being significant at days 3 and 7. All incisions healed uneventfully with cosmetically acceptable outcomes. Use of barbed suture devices that do not require knots for security provide an alternative for cosmetic dermal closures and have the potential to alleviate complications typically associated with knots such as suture breakage, tissue distortion, and extrusion. In this study V-Loc™ 180 device was significantly stronger than Quill™ SRS PDO during the critical phases of wound healing in skin.