

Fascia Attachment Optimization during Pelvic Organ Prolapse Surgery; An Animal Model

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Introduction

Pelvic Organ Prolapse is a female pelvic floor disorder that is common and increases in frequency with age. There are conservative measure of addressing this problem, but 1 in 10 cases require surgical repair. Autologous Fascia is an option for surgical repair, but it comes with the risk of suture pull-through. Currently there are no published studies that demonstrate the optimal suture configuration on the fascia or vaginal tissue to maximize the tensile strength and prevent suture pull through.

Objective

Our goal is to determine the ideal method of suture placement through fascia and vaginal tissue using an animal model. We hypothesized that the risk of suture pull through would be mitigated with the use of a triple knot or barbed suture with a vicryl mesh overlay which would have a greater tensile strength when compared with single interrupted sutures alone.

Barbed Suture



Single Interrupted Suture



Materials and Method

Strips of bovine fascia model were sutured together in an overlapping fashion with synthetic absorbable polydioxanone sutures (Ethicon, Inc.) or with Stratifix Spiral PDO barbed bidirectional suture (Ethicon, Inc.). For the comparison of frozen versus fresh specimens, the samples were then frozen for 48 hours thawed for 12 hours. The suture pullout strength of the prepared samples was tested using an Instron 5544. Assuming a 2-sided α of .05, in order to have 90% power to detect a 50% difference in the mean between groups, a sample size of 6 in each comparison was needed. A one-way ANOVA test was performed to determine differences between the means of three or more independent groups and students t-test use to finds difference between the means of two groups.

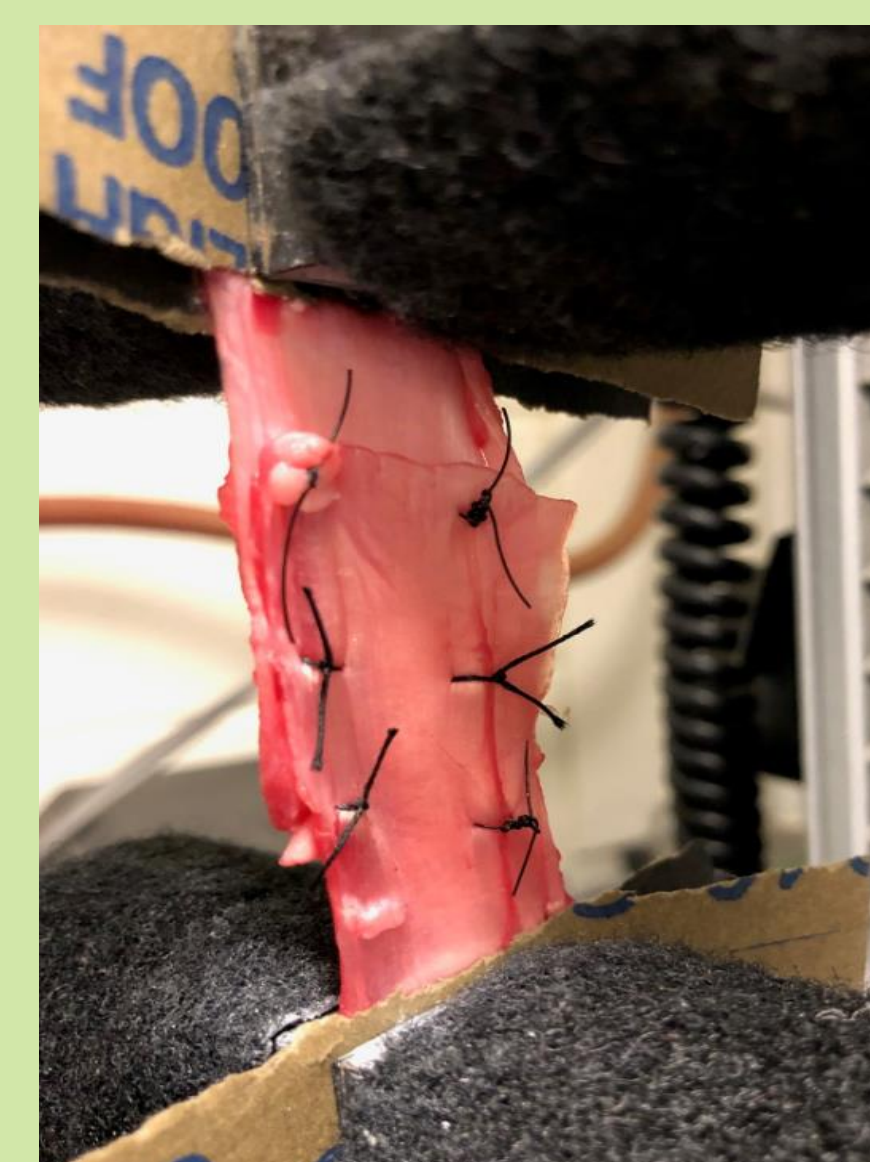


Figure 1: Sample of single suture fascia animal model being tested on an Instron 5544.

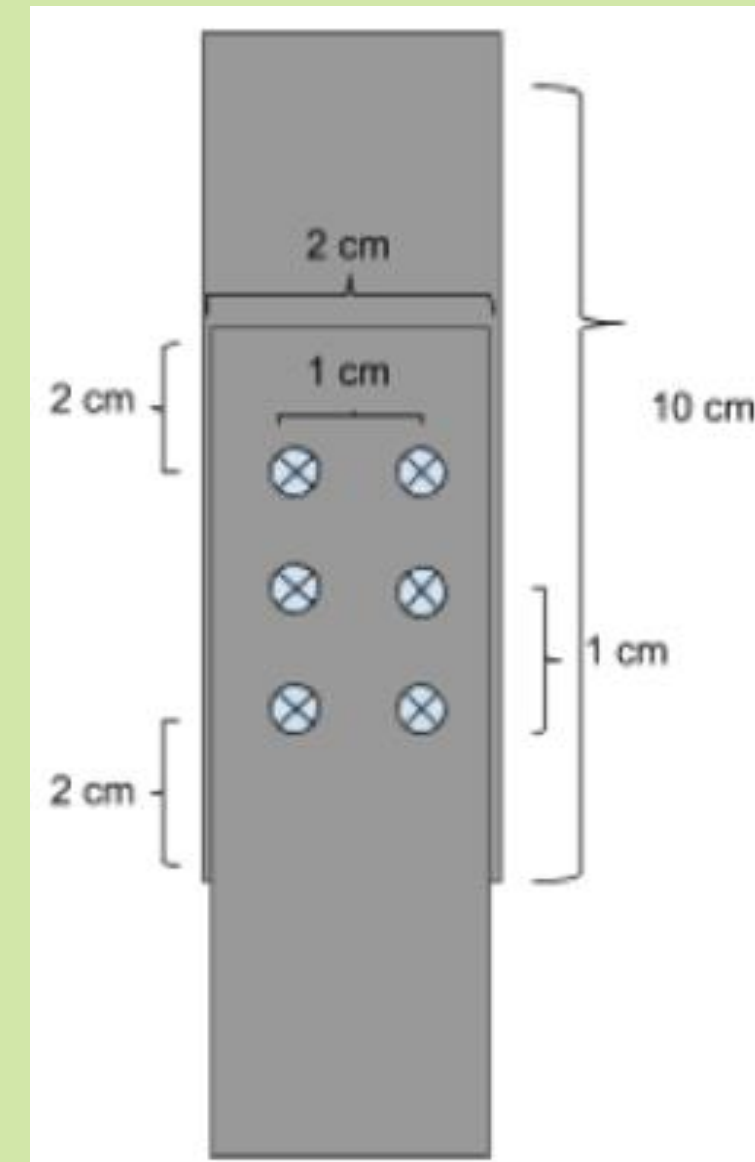


Figure 2: Measurements and arrangements of sutures on the bovine fascia model.

Results

Table 1 Comparison of three suture methods with and without mesh overlay

Attachment method	6 Single 3-0 PDS Knots	6 Single 3-0 PDS Knots with Vicryl Mesh	6 Triple 3-0 PDS Knots	6 Triple 3-0 PDS Knots with Vicryl Mesh	Barbed 0 PDS	Barbed 0 PDS with Vicryl Mesh	P value (comparing single versus barbed)
Avg. Max Load (N)	25.39	27.00	83.85	66.46	244.00	243.13	0.0003
Standard Deviation (N)	9.62	6.80	32.98	25.97	51.52	130.47	

Table 2 Comparison of fresh versus frozen barbed and single knot suture attachments

	Barbed			6 single knots		
	Fresh	Frozen	P-value	Fresh	Frozen	P-value
Avg. max Load (N)	215.27	81.11	0.0004	21.01	25.39	0.99
St. Dev (N)	84.12	37.60		4.10	9.62	

Figure 1: Pressure plot of barbed versus single knot suture attachments

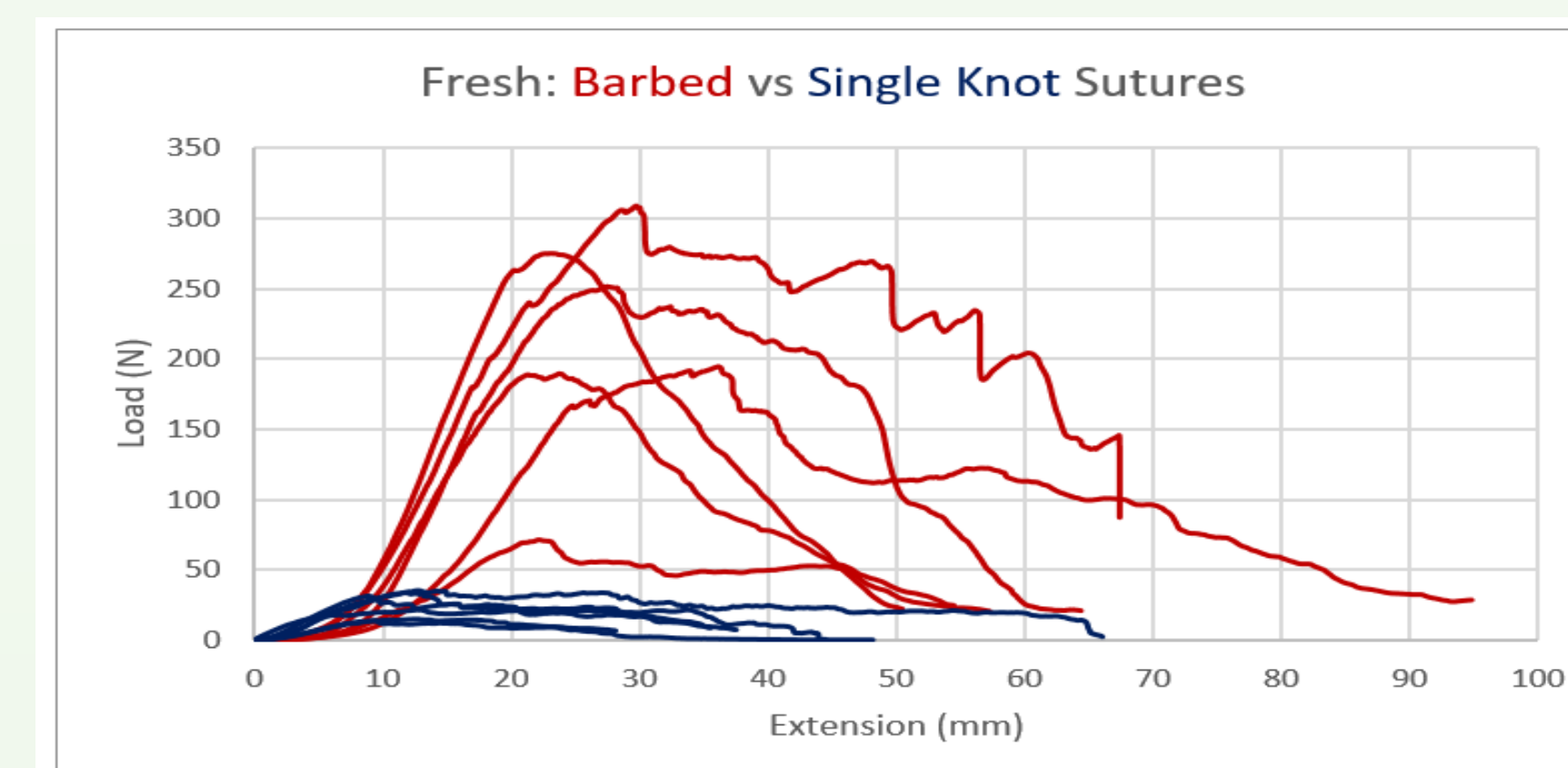
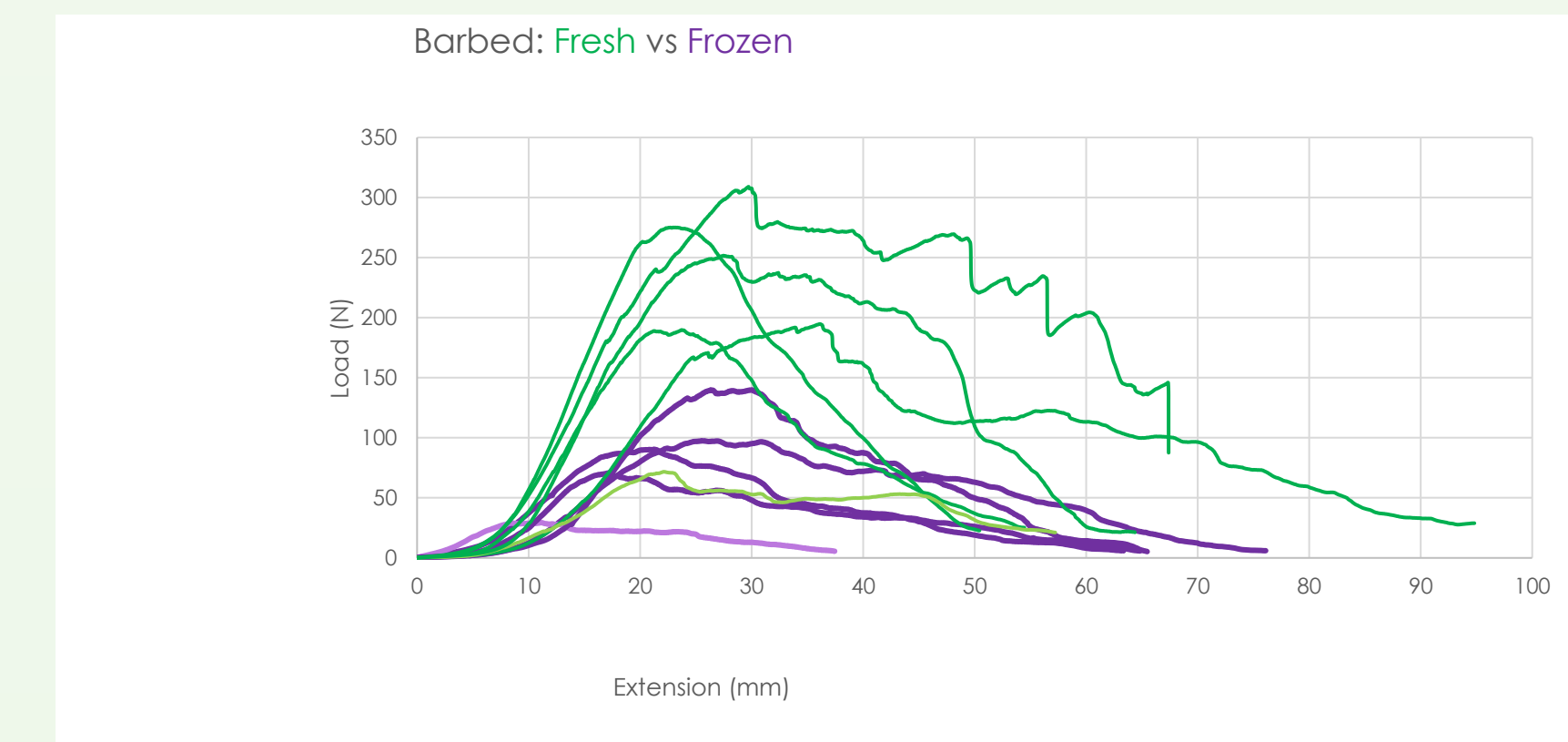


Figure 2: Pressure plot of fresh versus frozen barbed suture attachment



The mean maximum load for the single suture attachment was 25N, compared to 84N and 244 N for the triple knot and barbed suture attachments respectively (P-value 0.0003). The addition of a Vicryl mesh overlay did not increase tensile strength. Freezing and thawing the tissue resulted in a decrease in tensile strength of the barbed suture specimen but not for the single suture attachment technique.

Conclusion

The use of barbed suture for fresh fascial attachment results in greater tensile strength when compared with two methods of single interrupted sutures in this study. This data may be used to support attachment of fascia during pelvic organ prolapse surgery. In vivo studies are recommended to further evaluate anatomical outcomes.

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