The Effect of Flexor Digitorum Profundus Tendon Advancement on the Development of Quadriga Syndrome in the Treatment of Jersey Finger: A Biomechanical Study

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Introduction

Current recommendations discourage advancing the flexor digitorum profundus (FDP) tendon more than 1 cm during primary repair of a jersey finger in order to prevent the development of quadriga. However, this common recommendation has not been validated. We hypothesize that advancing the FDP tendon greater than 1 cm will significantly increase the force required to form a fist but advancing the tendon less than 1 cm will not.

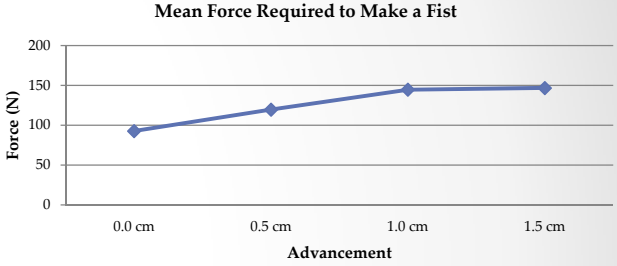
Methods

Six fresh frozen cadaver forearms were utilized

The FDP muscle belly was dissected and a force measuring device attached to the musculotendinous junction. A laceration injury to the FDP tendon of the ring finger was created at the level of the DIP joint. This laceration was then repaired with advancement of the tendon of 0.5, 1.0 and 1.5 cm. The force required to bring the fingertips of the middle, ring and small fingers was then recorded.

Results

The average force required to form a fist prior to the creation of a jersey finger was 92.7 N. At 0.5 cm, 1.0 cm, and 1.5 cm the average force was 119.6 N, 144.6 N, and 146.7 N respectively. Significantly more force was required to form a fist when the FDP was advanced by 0.5 cm in comparison to no advancement ($p<0.0001$) and by 1.0 cm in comparison to 0.5 cm of advancement ($p<0.0001$). However, there was not a significant difference in force required to make a fist between 1.0 cm and 1.5 cm of tendon advancement ($p = 0.4376$).



Advancement	N	Mean	Std Error	Minimum	Maximum
0.0 cm	60	92.7 N	3.129	62.275 N	173.48 N
0.5 cm	60	119.6 N	2.2	84.5 N	169.03 N
1.0 cm	60	144.6 N	2.68	106.75 N	204.6 N
1.5 cm	60	146.7 N	2.68	97.86 N	191.27 N

P-values of the force required to form a fist of the resultant levels of advancement

Comparison	Arm 1	Arm 2	Arm 3	Arm 4	Arm 5	Arm 6	All Arms
1.5cm vs 0.0cm	0.0002	0.1976	0.0002	0.0002	0.0002	0.0002	<0.0001
1.0cm vs 0.0cm	0.0002	0.0956	0.0004	0.0002	0.0002	0.0002	<0.0001
0.5cm vs 0.0cm	0.0002	0.7323	0.0049	0.0003	0.0002	0.0002	<0.0001
1.5cm vs 0.5cm	0.0166	0.2101	0.0008	0.0002	0.0002	0.0002	<0.0001

Discussion

Our cadaver based study provides biomechanical evidence that there is a consistent increase in the force required to form a fist with advancement of the FDP tendon of the ring finger up to 1.0 cm. After advancement to a distance greater than 1.0 cm, there is a plateau effect in which the subsequent force required to form a fist is not significantly increased. This data suggests that if advancement of the FDP tendon up to 1.5 cm is required for operative repair of a jersey finger, there may be no additional risk of developing quadriga syndrome than advancement of 1.0 cm.

Summary

Significantly more force is required to form a fist with advancement of the FDP tendon up to 1.0 cm

There is not a significant increase in force between 1.0 and 1.5 cm of tendon advancement.

If advancement of the FDP tendon more than 1 cm is required for primary repair of a jersey finger, there may not necessarily be an elevated risk of developing quadriga.