

CHANGES IN TENSION PROPERTIES OF TENSION-FREE VAGINAL TAPE WITH SOAKING FLUIDS

Hypothesis / aims of study

Previous reports on tension properties of sling tapes were done in dry state, which is the same condition as factory-packing state [1]. But the tape is not in a dry state after putting in human body, where the tension properties really matter. To evaluate changes in tension properties of Tension-free Vaginal Tape (TVT) according to surrounding environments, we measured linear tensions of TVT in different conditions.

Study design, materials and methods

We measured linear tensions of TVT in three different conditions; TVT soaked in normal saline (N group), TVT soaked in human serum (S group), TVT in dry state (control group). Soaking time was 30 minutes in each group. First, resting length was measured by Digital micrometer (Mitutoyo co., error range 0.005 mm), and at the same time resting tension was setting to zero point. Subsequently linear tensions were measured by DigiForce Gage (Atomic co., error range 0.049 N) with 5%, 10% extension of resting length. Length-tension properties of N or S groups were compared with those of control group.

Results

The number of TVT used in measuring linear tensions were 6 in control group, 7 in N group, and 7 in S group. Average linear tensions of control group were 0.343 Newton (N) with 5% extension, 0.686 N with 10% extension (table 1). Average linear tensions of N group were 0.350 N with 5% extension, 0.644 N with 10% extension, which were not significantly different from control group. Average linear tensions of S group were 0.209 N with 5% extension, 0.433 N with 10% extension, which were significantly decreased from control group ($p < 0.05$, Student t-test).

Table 1. Measured tensions in experimental groups

group (n)	5% extension		10% extension	
	mean (Newton)	SD	mean (Newton)	SD
Control group (6)	0.343	0.0157	0.686	0.0000
N group (7)	0.350	0.0153	0.644	0.0153
S group (7)	0.209*	0.0075	0.433*	0.0153

*: statistically significant ($p < 0.05$, Student t-test)

SD: standard deviation

Control group: Tension-free Vaginal Tape (TVT) in dry state

N group: TVT soaked with normal saline for 30 minutes

S group: TVT soaked with human serum for 30 minutes

Interpretation of results

According to our results, average linear tensions of TVT soaked in human serum were significantly higher than those of TVT in dry state. Because average linear tensions of TVT simply wet with normal saline showed no significant changes than those of TVT in dry state, tensions were not related to either dry or wet conditions. The difference in tension properties between TVT soaked with human serum and TVT soaked with normal saline seems to come from the difference in viscosities of these two surrounding conditions. More viscous human serum adhered to pores of tape during soaking could give additional tension forces to original tension properties.

Concluding message

Tension properties of TVT can be changed with surrounding environment. Therefore we recommend that reports on tension properties of sling tapes should include the values not only in dry state but in the state soaked in human serum as well.

References

Mechanical properties of urogynecologic implant materials. Int Urogynecol J (2003) 14: 239-43.