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Bullock T[1], Klutke J[2], Klutke C[1]
1. Division of Urologic Surgery, Washington University School of Medicine, 2. Department of Obstetrics and Gynecology, University of Southern California-Keck School of Medicine

COMPARISON OF PULL-OUT FORCE OF RETROPUBIC, PREPUBIC AND TRANSOBTURATOR MIDURETHRAL SLINGS IN A CADAVER MODEL

Hypothesis / aims of study
In the retropubic (RP) midurethral sling procedure, commonly known as TVT, a polypropylene mesh tape in placed traversing the retropubic space to provide a backboard of support to the midurethra at times of increased intra-abdominal pressure. The passage of trocars blindly through the RP space may lead to visceral, nerve, and major vascular injury during sling placement. Newer introduction techniques, such as the pre-pubic (PP) TVT and Transobturator (TO) sling may minimize this risk. These procedures differ in the way the superior ends of the sling are anchored in the soft tissue of the pelvis and these differing vectors could alter the stability of the supporting segment of mesh. Our objective was to compare the resistance to displacement (i.e. "pull-out" force) of mesh introduced by these three different techniques of midurethral sling placement.

Study design, materials and methods
Identical strips of monofilament polypropylene mesh (Gynecare, Somerville, NJ, USA) were sequentially placed in 6 fresh unembalmed cadavers by the RP, PP, and TO routes according to the original technique descriptions. Immediately after mesh placement downward force on the sling was applied with a Chatillon force gauge (model DP-30, John Chatillon and Sons, Greensburo, NC). Measurement was made of the force that resulted in mesh displacement from the cadaver and the length of mesh in contact with soft tissue was recorded.

Results
Mean force required for displacement of mesh placed by the RP, PP, and TO techniques were 5.9 lbs, 4.8 lbs and 3.6 lbs, respectively (Table 1). The average sling length in contact with tissue was 10.2 cm, 9.0 cm and 6.9 cm for the RP, PP, and TO techniques respectively.
We observed a linear relationship between the length of the mesh in contact with tissue and the force required to dislodge it from the body (Figure 1).

Cadaver	Retropubic Mesh Placement (lbs)	Prepubic Mesh Placement (lbs)	Trans-Obturator Placement (lbs)
1.	5.2	6.0	4.6
2.	5.5	2.2	3.7
3.	7.9	4.0	5.2
4.	4.5	7.0	4.5
5.	6.3	3.5	3.8
6.	6.0	4.8	5.5
Average	5.9	4.8	3.6
St. Dev.	1.2	1.3	1.1

Table 1: Pull-Out Force Measurements

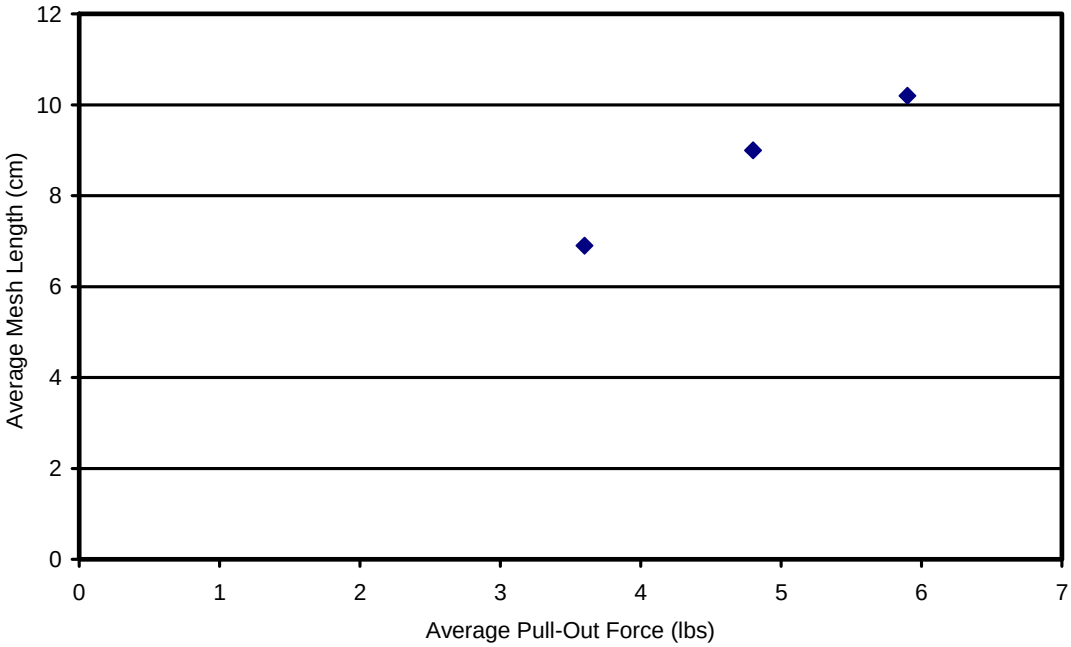

Figure1: Mesh length vs pull-out force

Interpretation of results

There was a statistically significant difference in mean pull-out force of polypropylene slings placed by RP and TO routes ($p < 0.05$). Conversely, there was no significant difference in displacement force between RP and PP methods of sling placement. There was a linear relationship between mesh length and the pull-out force required for displacement. These finding suggesting that longer segments of mesh in contact with soft tissue resulted in greater resistance to the displacing force rather than placement of sling material across muscle and fascia planes.

Concluding message

The pull-out force required for sling displacement is similar between RP and PP methods of mesh placement and significantly lower for slings placed by the TO technique. These differences likely result from the length of sling material in contact with body tissues rather than passage through muscle and fascia. The clinical impact of these findings and its effects on continence cure has yet to be clearly defined.

References

1. Int Urogynecol J (1996) 7; 81-6.
2. Progres en Urologie (2001) 11; 1306-13.
3. Eur J Obstet Gynecol (2003) 107; 205-207.

FUNDING: None

HUMAN SUBJECTS: This study did not need ethical approval because No ethics commitee approval was needed as cadavic subjects were used who had donated their bodies for scientific endevors. but followed the Declaration of Helsinki Informed consent was not obtained from the patients.