

CONNECTIVE TISSUE LOOSENESS AT SPHINCTER AREA IMPORTANT CAUSE OF STRESS URINARY INCONTINENCE AFTER RADICAL PROSTATECTOMY

Hypothesis / aims of study

In the past sphincter damage and/or denervation are supposed to be the main causes of stress urinary incontinence after radical prostatectomy. Now it can be hypothesised that connective tissue looseness at sphincter area can be an important factor of stress urinary incontinence after radical prostatectomy. Division of the endopelvic fascia, the puboprostatic ligaments and the Denonvillier's fascia can loosen the supporting structures of the sphincter complex by tissue movement back and downwards (figure 1). The pathophysiologic basis for the development of stress urinary incontinence has been worked

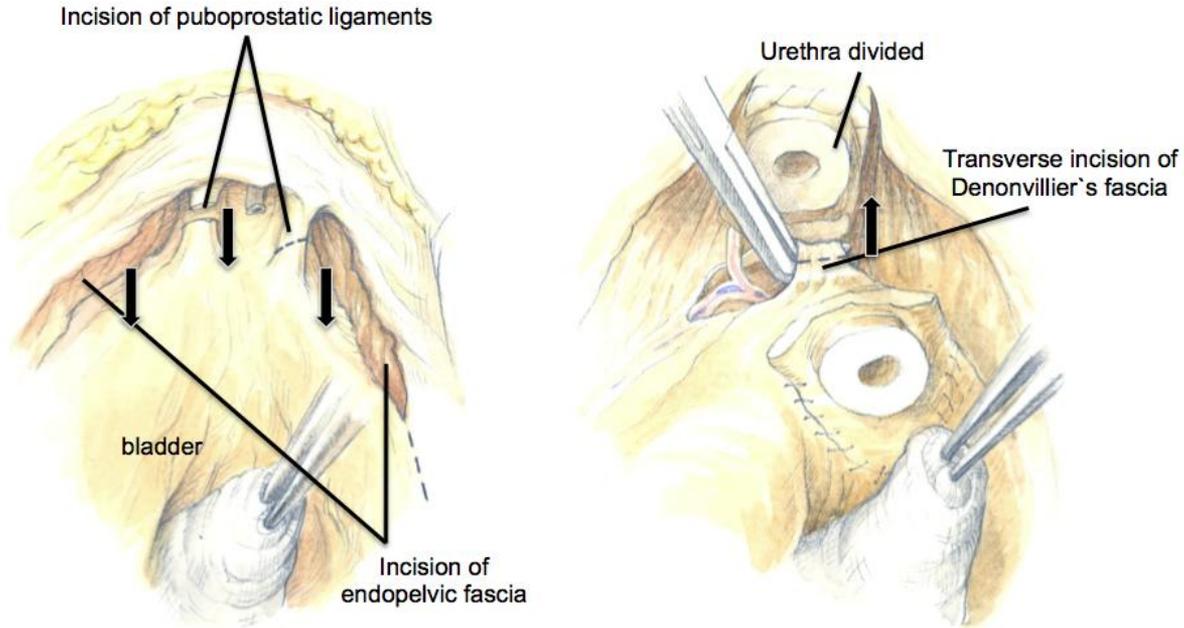


Figure 1: Incision of endopelvic fascia, puboprostatic ligaments and Denonvillier's fascia can produce looseness of the supporting structure of the sphincter complex. Arrows show the direction of tissue movements which occur after division.

Study design, materials and methods

45 patients with mild and moderate stress urinary incontinence after radical prostatectomy have been examined by videoendoscopy of the urethra pre, during and after implantation of a retrourethral, transobturatoric sling. The effect of looseness induced weakness of the rhabdosphincter should be explained by basic physical laws.

Results

In all patients a weak sphincter contraction in a shortened sphincter area could be detected. After elevation of the bulbous urethrae an improved concentric sphincter contraction at a lengthened sphincter area was observed. This occurred immediate and reproducible. With enlarged radius the rhabdosphincter overextends.

Interpretation of results

After Gordon (1) overlengthening of the muscle cause reduction of the muscle force. (figure 2).

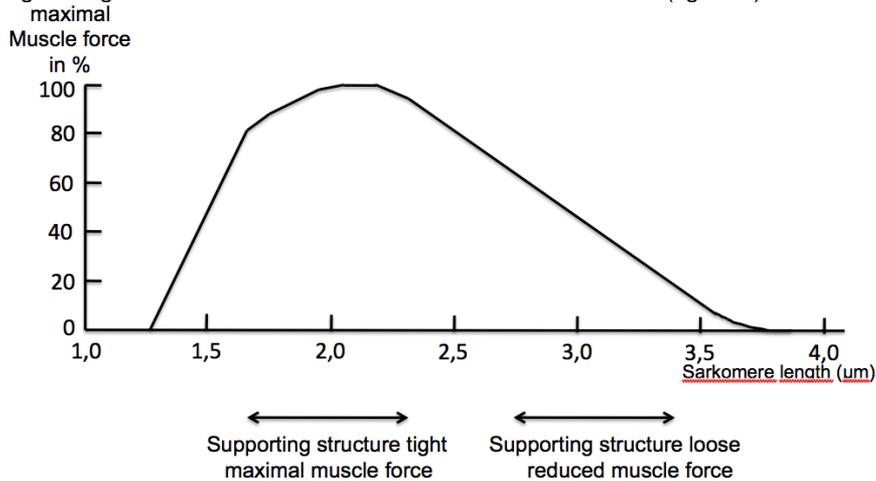


Figure 2: Relationship between maximal muscle force and muscle (sarcomere) length after Gordon (1)

Reduction of looseness can reduce the overextension of the muscle, thus enhancing the muscle force. This improved sphincter contraction can also be explained by the Laplace law. The intraurethral pressure correlates indirectly to the radius within the sphincter. By reducing the looseness the radius with the urethra during stress is diminished and the intraurethral pressure rises which can be seen as improved sphincter contraction. Stress incontinence can be explained using the Hagen-Poiseuille's law. The resistance to flow within the sphincteric urethra during stress situation correlates directly to the length of the urethra and indirectly to the intraurethral radius with the fourth power. Thus enlargement of the radius within the urethra dramatically reduces the resistance. In patients with loose connective tissue stress can cause enlargement of the radius, reduction of intraurethral pressure and resistance. Reduction of looseness will reduce the intraurethral radius and enhance the resistance and the intraurethral pressure.

Concluding message

These endoscopic findings and explanations constitute high evidence that looseness of connective tissue is an important cause of stress urinary incontinence after radical prostatectomy. This means that stress urinary incontinence can be cured by reduction of this looseness. Low intraurethral pressure and low resistance can be caused by enhancement of intrasphincteric or intraurethral radius, even in patients with morphological normal rhabdosphincter. Simulated operations during videourethroscopy (elevation of the perineum in the outpatient clinic or the bulbus urethrae intraoperatively) can uncover the effect of looseness on the sphincter and be helpful in selection of patients for sling surgery and adjustment of the sling intraoperatively.

References

- Gordon AM, Huxley AF, Julian FJ: The variation in isometric tension with sarcomere length in vertebrate muscle fibres. J Physiol 1966; 184: 170-192

<i>Specify source of funding or grant</i>	No
<i>Is this a clinical trial?</i>	No
<i>What were the subjects in the study?</i>	HUMAN
<i>Was this study approved by an ethics committee?</i>	No
<i>This study did not require ethics committee approval because</i>	Observational study under routine surgery, fundamental physiologic explanations
<i>Was the Declaration of Helsinki followed?</i>	Yes
<i>Was informed consent obtained from the patients?</i>	Yes