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A NOVEL MAGNETIC DEVICE TO PREVENT URINARY INCONTINENCE.

Hypothesis / aims of study
Stress Urinary Incontinence (SUI) is due to an urethral hypermobility (UH) and/or intrinsic sphincter deficiency (ISD). Surgery more likely cure UH rather than ISD, and usually is associated with a higher failure rate (1). Conversely, the improvement of sphincteric mechanism can cure SUI due to UH (2). In this research we propose an original magnetic device designed to strengthen the hypo-atonic urethral sphincter for a "tailored correction" of the urinary incontinence according to the severity of ISD.

Study design, materials and methods
The magnetic prosthesis consists of a pair of small magnetic plaques to be inserted, with a minimally invasive procedure, on the left and right side of the urethral conduit with their opposite polarities face to face, so that, attracting themselves, close the urethral lumen. The effectiveness of the magnets was tested in three suine anatomical preparations. Magnets of different magnetic force, such as ferrite and plastoferrite (the first with a higher magnetic force than the other) were tested. Bladder was filled through an incannulated ureter by a constant infusion of saline at a flow-rate of 50 ml/min . Bladder pressure was recorded through a second catheter inserted into the bladder through the controlateral ureter. The effectiveness of magnetic closure was tested by determining vesical leak point pressure. The mean values obtained before and after magnet insertion were statistically compared with the Student *t* test.

Results
The vesical leak point pressure after the insertion of ferrite magnets was 37.2±5.2 cmH_2O and after plastoferrite magnets was 15.1±3.7 cmH_2O, all of them significantly ($p<0.05$) higher than the pressure recorded without the magnets (6.9±1.4 cmH_2O).

Interpretation of results
The implant of a pair of magnets on both sides of the urethral wall is able to increase the vesical leak point pressure at a value dependent on the force of the magnets. By choosing magnets of different force, even more potent than those used in this experiment, such as those of neodymium, it is possible to obtain an urethral closure pressure that meets the desired requirements, performing a "tailored correction" of the urinary incontinence.

Concluding message
The main advantage of this system lies in the fact that the magnets create a "dynamic closure", the mechanism of which has been previously demonstrated (3).When the magnets are detached by an urethral pressure above the magnet strength, they allow an easy transit of contents, whereas other systems, such as bulking agents or obstructive slings, create a rigid narrowing that may hinder the passage of urine. Once verified "in vivo" (experimental animal) the effectiveness and tolerability of magnets covered by a biocompatible sheath, this device could represent a simple and effective solution of the urinary incontinence.

References
1. Curr Opin Urol 2003;13:301
2. Eur Urol 2005;48:552
3. J Biomechanics 2006;39:564

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