244

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Title: THE TENSILE STRENGTH OF COOPER'S LIGAMENT SUTURING: COMPARISON OF TRANSVAGINAL VERSUS ABDOMINAL TECHNIQUES

Aims of Study:

To compare the relative strength of sutures anchored into Cooper's ligament by an open abdominal versus transvaginal approach using a curved 'push and catch' transvaginal suturing device.

Methods:

In twelve fresh frozen cadavers, Cooper's ligament was accessed via both a low transverse abdominal incision and anterior vaginal incision into the retropubic space. After randomization, four polytetrafluroethylene (OO) sutures were spaced along one ligament abdominally (n=42), simulating a conventional retropubic urethropexy. Contralaterally, four sutures were placed with the transvaginal suturing device (n=42), specifically designed for suturing into Cooper's ligament by the transvaginal approach. While suturing, surgeons were blinded to the contralateral side. Sutures were passed through the ipsilateral vaginal tunnel, to a hand held digital tensiometer. Progressive tensile load was applied along the axis of the vagina, until the suture either broke or was completely dislodged from the ligament.

Results:

Peak tension averaged 14.57 psi for abdominally placed sutures, and 12.96 psi for the vaginal sutures (p=0.28). The paired t-test revealed a mean difference of 1.62 psi between abdominal and vaginal sutures (p=0.16). Suture breakage rather than ligament 'pullout' was the most common failure mode for both abdominal and vaginal suturing, but was significantly more likely for abdominal sutures (95 vs. 56%, p=0.0001). Right and left-sided sutures were equivalent in terms of peak tension (13.35 vs. 14.14 psi) and rates of ligament failure (76 vs. 74%). Multiple logistic regression demonstrated that transvaginal suturing was independently predictive of ligament failure after controlling for cadaver number, ligament side and study site. Finally, vaginal and abdominal sutures were similarly 'targeted' along Cooper's ligament, with a nearly identical mean distance from the mid-pubic symphysis (4.62 vs. 4.24cm, p=0.56). Peak tension was not correlated with suture location along the ligament (r^2 = 0.17, p=0.28).

Conclusions:

Transvaginal suturing to Cooper's ligament offers a useful, minimally invasive suspension point for the surgical treatment of genuine stress incontinence. This 'push and catch' transvaginal suturing device is capable of delivering sutures with equal strength compared to open abdominal suturing, targeted consistently within the 'optimal' portion of the ligament as defined by the gold standard abdominal retropubic urethropexy. The average peak tensile strength is similar for vaginal and abdominal suturing. Transvaginal suturing is associated with a greater likelihood of 'ligament failure' before suture breakage when maximal tension is applied using polytetrafluroroethylene (OO), however the clinical relevance of this finding is uncertain.

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