INTRODUCTION

Hysterectomy is the most common performed major surgery for all women, and most are performed on women between ages of 40 and 44, thus its consequences concern many women ***(Rannested, 2005)***.

About 40% of hysterectomies are elective and these elective procedures are expected to treat abnormal bleeding, chronic pelvic pain and symptomatic myomas, and to improve health related general quality of life ***(Uzun and Savas, 2009)***.

Vaginal vault prolapse has been defined by the International Continence Society as descent of the vaginal cuff below a point that is 2 cm less than the vaginal length above the plane of the hymen ***(Abrams et al., 2002)***.

Women who had 4 or more vaginal deliveries have 12 times more risk of genital prolapse, from the literature, it appears that vaginal delivery causes damage to the pudendal nerve and promotes the development of pelvic organ prolapse. There are suggestions that instrumental vaginal delivery, especially forceps delivery increase the risk. Also it was demonstrated that Caesarean section can avoid the pudendal nerve damage caused by vaginal delivery. Inspite of the absence damage to the pudendal nerve at caesarean section ***Maclennan et al.*** showed that there was no significant difference in pelvic floor dysfunction between caesarean section and vaginal delivery. However pelvic floor dysfunction was significantly commoner following Instrumental delivery ***(Moall, 2003)***.

The risk of uterovaginal prolapse increases with the number of vaginal birth and is higher in obese women ***(Progetto Menopausa Italia Study Group, 2000)***.

Prolapse does have a negative impact on women quality of life due to associated urinary, ano-rectal, as well as coital dysfunction. It is therefore important to counsel these women and carefully assess the defects of the various vaginal compartments before planning management. A clear understanding of the supporting mechanisms for the uterus and the vagina is important in order to make the right choice of the corrective procedure and also to minimise the risk of posthysterectomy occurrence of vault prolapse ***(Flynn, 2002)***.

The vaginal apex forms the capstone of support and adequate attention should be given to the re-suspenion of the vault at the time of vaginal hysterectomy ***(Shall, 2000)***.

A number of techniques are commonly employed at vaginal hysterectomy to prevent apical prolapse. Surgical procedure for treatment of vaginal vault prolapse are generally categorized as either obiletrative or reconstructive and can be performed either abdominal or vaginal (**Shall, 2000**).

Sacrospinous fixation was first described by Sederl in 1958 and later popularized in Europe by Ritcher and Albright and in the US by Radall and Nicholas ***(Sze and Karran, 1997).***

There is remarkable variation in the failure rates reported for sacrospinous ligament fixation. Recent literature reviews summarizing outcomes found that failure rates for "objective" findings (adequate vaginal support assessed by a physician) ranged from 3% to 37% and for "subjective" relief of prolapse symptoms ranged from 6% to 30% ***(Beer and Kuhn, 2005; Sze et al., 1999)***. Possible reasons for this variation in objective and subjective outcomes have not been explored until a study was done by ***Morgan et al. (2007)***.

With the loss of fertility, women who have undergone a hysterectomy may become worried about and afraid of many issues such as changes in their relationship with their husband, changes in body image, effects of menopause and physical energy loss. Many difficulties are reported by patients with uterine problems, including physical and menstrual symptoms, pain, emotional and sexual dysfunctions and decrease in general health perception ***(Uzun and Savas, 2009)***.

In general, quality of life is affected negatively by the increase in the severity of these problems, and serious symptoms lead women to seek surgical treatment. According to studies, a great majority of women who had undergone hysterectomies report that their quality of life improved as a result of alleviation of their problems after the operation, their perception of general health improved, pain and physical symptoms decreased ***(Uzun and Savas, 2009)***.

According to SOGC (Society of Obstetricians and Gynaecologists of Canada) clinical guidelines for hysterectomy, in the properly selected patient, the result from the surgery should be an improvement in the quality of life ***(Lefebvre et al., 2002)***.

Nevertheless, in 40–50% of women who had undergone hysterectomies, complications like haemorrhage, urinary system injuries, bowel perforation and infections may be observed in the early post-operative period. Moreover, in the literature it is emphasised that women are experiencing physical, social and sexual problems such as post-operative fatigue, weight changes, irritability, insomnia, poor concentration or poor memory, crying spells, poor appetite, diarrhoea or constipation, sadness, changes in sexual behavior ***(Esen and Am, 2006)***.

AIM OF THE WORK

To compare the effect of vaginal hysterectomy with and without sacrospinous ligament fixation on the patients sexual function.

Anatomy of Sacrospinous Ligament Region

Region of the sacrospinous ligament:

The area around the sacrospinous ligament is another region that has become more important to the gynaecologist operating for problems of vaginal support. The SSL consists of dense connective tissue and contributes to the stability of the bony pelvis. It attaches to the ischial spine laterally and lower part of the sacrum and coccyx medially. In its medial portion it fuses with the sacrotuberous ligament and is a distinct structure only laterally. The sacrospinous, along with the sacrotuberous ligament, divide the sciatic notches of the ischium into the lesser and greater sciatic foramen (GSF). The internal pudendal and inferior gluteal vessels, sciatic nerve and other branches of the sacral nerve plexus pass through the GSF in close proximity to the ischial spines and SSL. On the superior or pelvic surface of the SSL lies the coccygeus muscle, which together with the levator ani muscles comprises the pelvic diaphragm. The coccygeus muscle has the same bony attachments and runs an identical course to the SSL; thus, many refer to these structures as the coccygeus–SSL (C-SSL) complex. The rectal pillar separates it from the rectovaginal space. It can be reached from the rectovaginal space by perforation of the rectal pillar to enter the pararectal space or by dissection directly under the enterocele peritoneum ***(Roshanraven et al., 2007)***. Complications specifically associated with SSLF include hemorrhage (2-8%), and perineal, gluteal, or lower extremity pain (3-15%) ***(Sze and Karram, 1997; Karram and Kleeman, 2003; Walters and Karram, 2007; Paraiso et al., 1996; Barksdale et al., 1998)***. These have inspired reconsideration and the evaluation of the pelvic anatomy in this region. However, most studies have focused on the vascular anatomy of the C-SSL complex in the region of the ischial spine and on pudendal nerve anatomy ***(Barksdale et al., 1998; Thompson et al., 1999; Barksdale et al., 1997; Mahakkanukrauh et al., 2005; Wallner et al., 2006)***. Although the anatomic location of the internal pudendal vessels and pudendal nerve justifies the recommendation that sutures be placed 2 finger breadths medial from the ischial spine, other neurovascular structures and relationships in this region need closer examination. Specifically, studies that evaluate the neurovascular anatomy associated with the medial or sacral portion of C-SSL are scarce and limited by the small number of specimens examined ***(Thompson et al., 1999; Barksdale***

et al., 1997; Mahakkanukrauh et al., 2005; Wallner et al., 2006; Barber et al., 2002).

The pudendal nerve (PN), a branch of the sacral plexus, is a motor–sensory nerve providing innervation to the urethra, the external anal sphincter, the levator ani muscles, the perineal skin, and the clitoris ***(Schraffordt et al., 2004; Snell, 1992)***. Knowledge of the precise location of the PN and its branches is important for avoiding nerve injury or entrapment during sacrospinous ligament (SSL) fixation.

Classic anatomic descriptions in current textbooks depict the PN lying directly posterior to the most lateral portion of the SSL and the ischial spine (IS) ***(Snell, 1992; Gray's anatomy, 1995)***. These illustrations may imply that placement of sutures medial to the IS will avoid nerve injury. Despite recommendations for placing sutures at approximately 2.5 cm medial to the IS, it is known that serious injuries to the pudendal neurovascular structures, sciatic nerve, and inferior gluteal vessels can occur leading to hemorrhage and/or nerve injury ***(Barksdale et al., 1988; Verdeja et al., 1995; Thompson et al., 1999)***.

The anatomy of the pelvic arteries adjacent to the SSL has been previously reported by ***Thompson et al.***

(1999) and an area free of arterial vessels has been mapped. Mapping of pelvic floor nerves adjacent to the SSL has been limited. A branch of the sacral nerves S3, S4, and/or S5, levator ani nerve (LAN) enters the pelvis superior to the SSL–coccygeus muscle complex and thought to innervate the levator ani muscles in conjunction with the PN ***(Gray's anatomy, 1995; Grigorescu et al., 2007)***.

When the LAN crosses the superior surface of the SSL–coccygeus muscle complex, it may also be susceptible to injury or entrapment during vaginal vault suspension to the SSL ***(Barber et al., 2002)***.

Three nerves were identified along the SSL, namely, the PN, the IRN variant (when present), and the LAN at mean distances of 0.6, 1.9, and 2.5 cm, respectively, medial to the ischial spine **(Fig. 1)** ***(Lazarou et al., 2008)***. These three nerves may be susceptible to injury during SSL fixation. Furthermore, ***Lazarou et al. (2008)*** showed that the PN was located posterior to the SSL–coccygeus complex, while the IRN variant pierced it, and the LAN crossed superior to the SSL–coccygeus complex. This topographic relation may have some clinical implications regarding the depth of suture placement and potential nerve injury during SSL fixation.

The IRN has been shown to innervate the external anal sphincter, which is thought to be responsible for voluntary fecal continence ***(Shafik, 2000; Shafik and Doss, 1999)***. Therefore, theoretically, injury to the IRN variant during SSL fixation could potentially contribute to fecal incontinence. However, this complication may be rare, and bilateral innervation may be protective ***(Lazarou et al., 2008)***.

Injury to the PN during SSL fixation is least likely, as it is located close to the ischial spine. ***Alevizon and Finan (1996)*** reported a case of postoperative chronic pudendal neuropathy after SSLF, with perineal and buttock pain that resolved immediately after removal of the sutures 2 years after the initial surgery.

As suggested by ***Wallner et al. (2006)*** potential injury to the LAN or branches of the PN may present as denervation of the pelvic floor muscles with accompanying dysfunction including urinary and/or fecal incontinence and pelvic organ prolapse. ***Damaser et al. (2003)*** described decreased leak point pressures and urinary incontinence in female rats after pudendal nerve injury, and transection of the levator ani nerve in rat experiments has resulted in levator ani muscle atrophy ***(Bremer et al., 2003)***.

Lazarou et al. (2008) postulated that buttock pain after SSL fixation could be attributed to referred pain caused by possible entrapment neuropathy involving the IRN variant, a mixed motor–sensory nerve, which travels through the mid-portion of the SSL–coccygeus muscle complex. This could be further supported by the observation that de novo fecal incontinence has been observed in some postoperative cases after SSL fixation ***(Lovatsis and Drutz, 2002)***.

The IRN and IRN variant innervate the external anal sphincter, and IRN variant injury after SSL fixation could conceivably contribute to fecal incontinence. The potential protection offered by bilateral innervation of the external anal sphincter could explain the rarity of this complication. Lastly, it is noteworthy that buttock pain and posterior thigh pain was most recently reported after uterosacral ligament suspension ***(Flynn et al., 2006)***.

The posterior femoral cutaneous nerve, originating from S1–S3 rami, has been implicated. The anatomic location of this nerve and its sensory distribution makes it unlikely to be responsible for the buttock pain observed after SSLF procedures. The goal of SSL fixation is to suspend the vaginal cuff unilaterally or bilaterally to the SSL to correct apical vault prolapse, while avoiding any nerve or vascular injury. Suture placement in SSL fixation has been described by some authors as placing one or more permanent sutures through the sacrospinous ligament medial to the ischial spine ***(Anthuber et al., 2002)***.

Lazarou et al. (2008) found the IRN to have a wide variation in its origin and location. (***Roberts et al., 1973)*** reported an IRN that formed directly from the sacral nerve plexus in 8 out of 40 (20%) cadaver dissections, but did not elaborate on which sacral rami it originated from.

Furthermore, ***Mahakkranukrauh et al. (2005)*** also demonstrated an IRN variant, independent from the pudendal nerve, originating from the S4 roots in 20% of cadavers and piercing through the SSL in 11% of cadavers studied. In the study done by ***Lazarou et al. (2008)***, 40% of dissections had an IRN variant originating directly from the sacral nerve plexus (S3, S4 rami) and not from the PN as it courses the pudendal canal as described classically ***(Snell, 1992; Gray's Anatomy, 1995)***. When present, the IRN variant was identified separately from the LAN in the same cadavers, coursed through the ischiorectal fossa, and terminated into the external anal sphincter and perianal skin, thus confirming its origin ***(Lazarou et al., 2008)***.

Some of the reported postoperative complications of SSLF, such as dyspareunia and pelvic pain are typically attributed to the non-anatomic posterior and lateral deflection of the vaginal axis. However, it is certainly possible that injury to the nerves that supply the coccygeus and levator ani muscles may lead to unrecognized muscle spasm or dysfunction ***(Roshanraven et al., 2007)***.

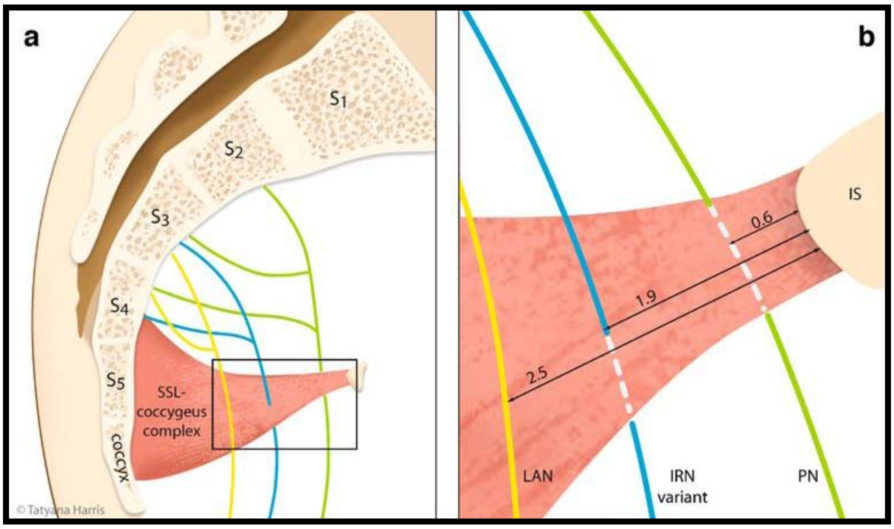

Figure (1): Schematic diagram illustrating the nerve distribution in the region of the coccygeus muscle sacrospinous ligament complex (SSL–coccygeus complex) in cadavers with an inferior rectal nerve variant, in the left hemipelvis. A. The levator ani nerve (shown in yellow) originates from the sacral foraminas S3 and/or S4 and crosses anterior to the SSL–coccygeus complex. Lateral to the levator ani nerve, the inferior rectal nerve variant (shown in blue) originates from the S3 and/or S4 nerve roots and pierces the midpoint of the SSL–coccygeus complex to enter the ischio-rectal fossa. The pudendal nerve (shown in green) originates from the S2, S3, and S4 nerve roots, and in most cadavers, it passes posterior to the SSL and medial the ischial spine. B. Magnified view of the nerves in diagram in (a). The nerves shown in (a), the levator ani nerve (LAN), the inferior rectal nerve variant (IRN variant), and the pudendal nerve (PN) are shown passing medial to the ischial spine (IS) at the mean distances of 2.5, 1.9, and 0.6 cm, respectively ***(Lazarou et al., 2008)***.