

SURGICAL ANATOMY OF THE VAGINAL VAULT



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Hypothesis/ Aims of Study

To elucidate the surgical anatomy of the vaginal vault.

Background

Vaginal vault (VV) surgery is a key part of curing a majority of pelvic organ prolapse (POP). The surgical anatomy of the vaginal vault has not, however, been subject to extensive examination.

Methods

Studies were performed on: (i) ten unembalmed cadaveric pelvis (observation only); (ii) one unembalmed pelvis (observation, dissection and histology); (iii) five formalin-fixed pelvis (dissection). The vaginal vault and its ligamentous attachments were examined. Four tissue blocks (1cm x 2cm) of the ligaments were taken from one unembalmed pelvis starting from its cervical attachment, sampling the ligaments at four equidistant points along its vertical extent.

Results

The VV is equivalent to the Level 1 section of the vagina (Figure 1) – uterine cervix (if present) and/or upper 2.5cm of vagina, measured posteriorly from the top of the posterior vaginal wall (**apex** or highest part of the vagina) to 2.5cm below this point¹. There are four fornices: anterior, posterior, left and right lateral with the cervix entering the vagina through the **anterior fornix**. The anterior fornix, pre-hysterectomy is generally lower and shorter than the posterior fornix. The VV posteriorly (2.5cm) is 33% of the Total Vaginal Length (TVL – apex to hymen) and 27% of the Total Posterior Vaginal Length (TPVL – apex to anterior perineum)².

The uterosacral ligament (USL) is attached to the posterior aspect of the cervix and VV. It spreads to the lateral aspects of the cervix and VV where it becomes confluent with the attachment of the cardinal ligament (CL) to form the cardinal-uterosacral ligament complex (CUSC - Figure 2). CL attachment to the VV is lost at hysterectomy though USL attachment is maintained. Proximal USL attachment is sacral: (i) vertically from the sacrococcygeal joint to S3; (ii) transversely from the pelvic sacral foramina medially to 5cm lateral to the sacro-iliac joint. Sacral backache is a key symptom of VV prolapse.

Axial Diagrams: Figure 3 (top) shows the VV pre-hysterectomy, with four fornices: (i) anterior fornix, through which the cervix protrudes; (ii) posterior fornix, behind the cervix, leading up to the vaginal apex;

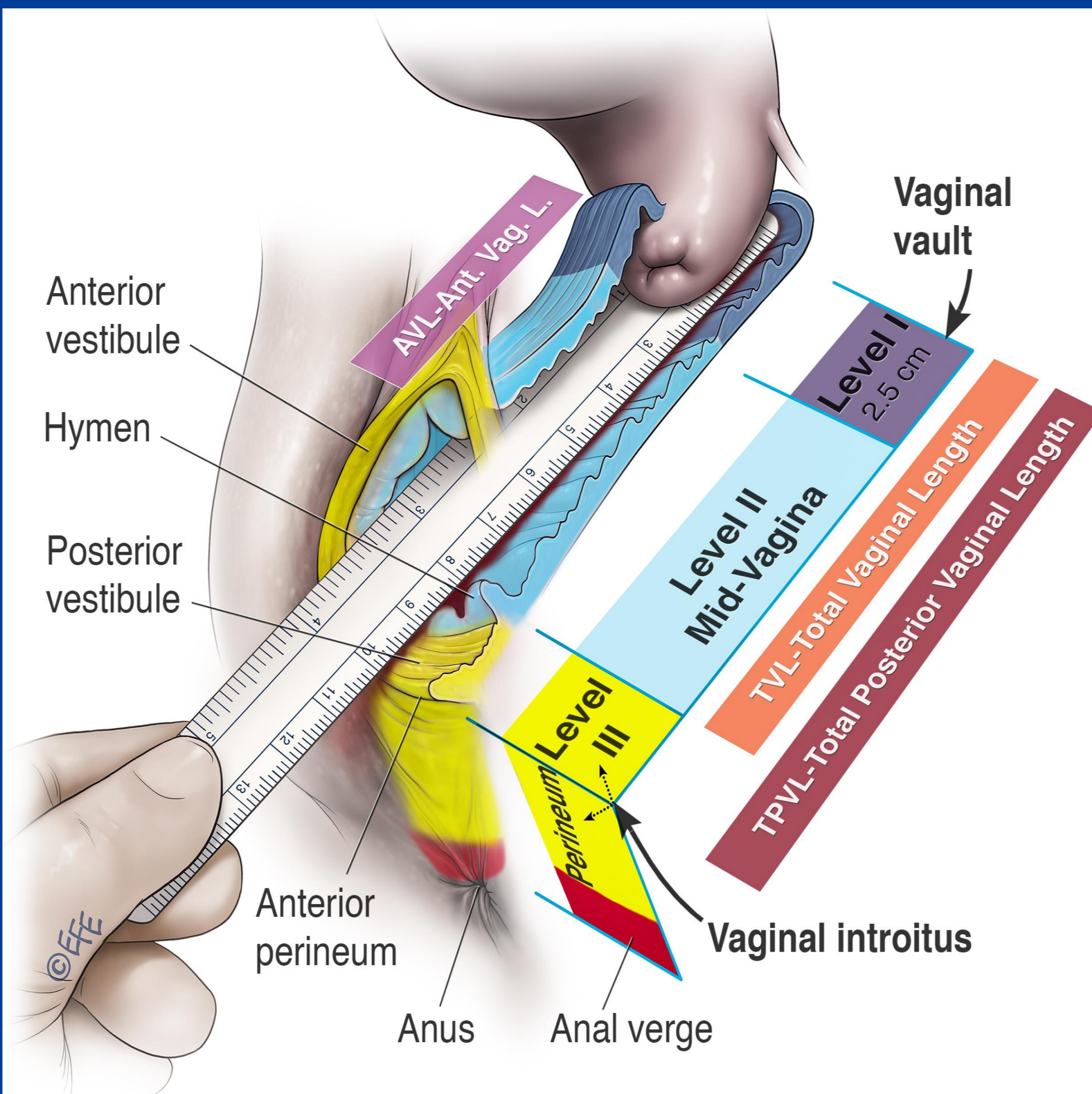


FIGURE 1: Vaginal vault is Level 1 of the vagina.

(iii, iv) two lateral fornices, to the side of the cervix. The **apex**, the highest point in the vagina, is in the posterior fornix.

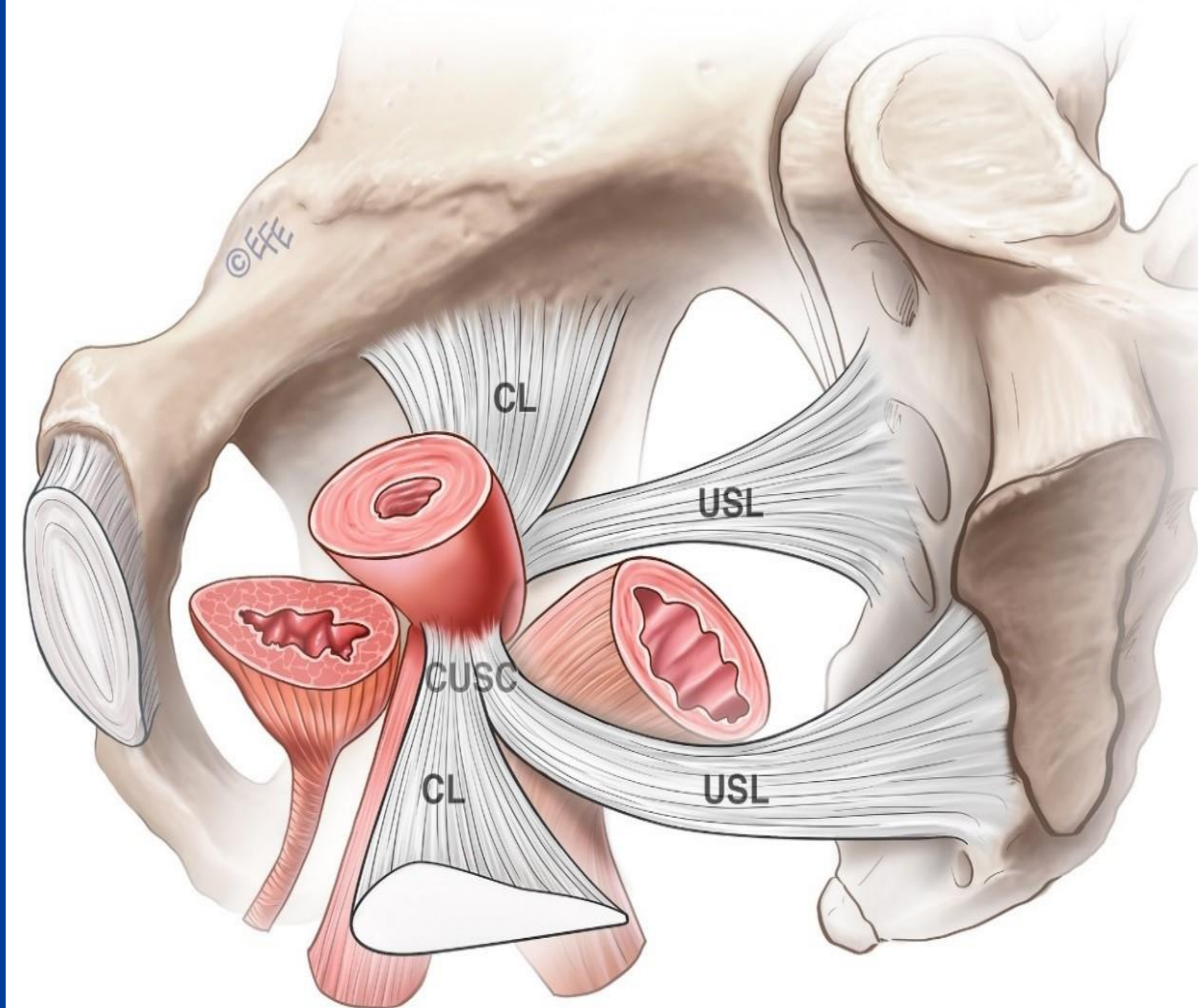


Figure 2: Cardinal ligament (CL) and Uterosacral (USL) have their distal segments fuse together to create a Cardinal Utero-Sacral Complex (CUSC).

Figure 3 (bottom) shows the VV post-hysterectomy (including cervix): (i) anterior fornix with the cuff scar generally visible as a horizontal line, at the lateral ends of which are small depressions (“dimples”) in the vaginal skin, beneath which is residual USL attachment; (ii) posterior fornix; (iii,iv) two lateral fornices. The cuff scar line (anterior fornix) is anterior to the vaginal apex (posterior fornix). A traction forcep has been placed around 1cm below the cuff scar line, around the area of the vaginal apex, to represent readiness for the assessment of VV (specifically apical) prolapse

Surgical implications: Any ligamentous support to the cuff scar at hysterectomy will, in turn, be applied to the anterior fornix, with the posterior fornix not directly involved. The maximal vaginal vault descent generally involves the posterior fornix (apical or posterior VV descent). VV supportive procedures should generally target that area.

Conclusions

1: The VV is equivalent to the Level I section of the vagina, measured posteriorly from the top of the posterior vaginal wall (apex or highest part of the vagina) to 2.5cm below this point³.

2: The VV internally has four fornices (thus “vault”). The anterior fornix, through which the cervix passes is lower and shorter than the posterior fornix. The latter has less support, particularly post-hysterectomy. It would be more vulnerable to prolapse, generally accompanying anterior (cystocele) and/or posterior (rectocele)

3: Prior to hysterectomy, the posterior aspects of the cervix and upper vagina are supported by the uterosacral⁵ (USL) and cardinal ligaments⁶ (CL), the distal segments of which fuse to create a cardinal-uterosacral ligament complex (CUSC), around 2-3cm long. Post-hysterectomy, there is some residual USL support to the anterior fornix though none to the posterior fornix, making that area more vulnerable to prolapse.

4: Concluding message: A knowledge of the surgical anatomy of VV greatly helps the understanding of VV and accompanying vaginal prolapse and its management.

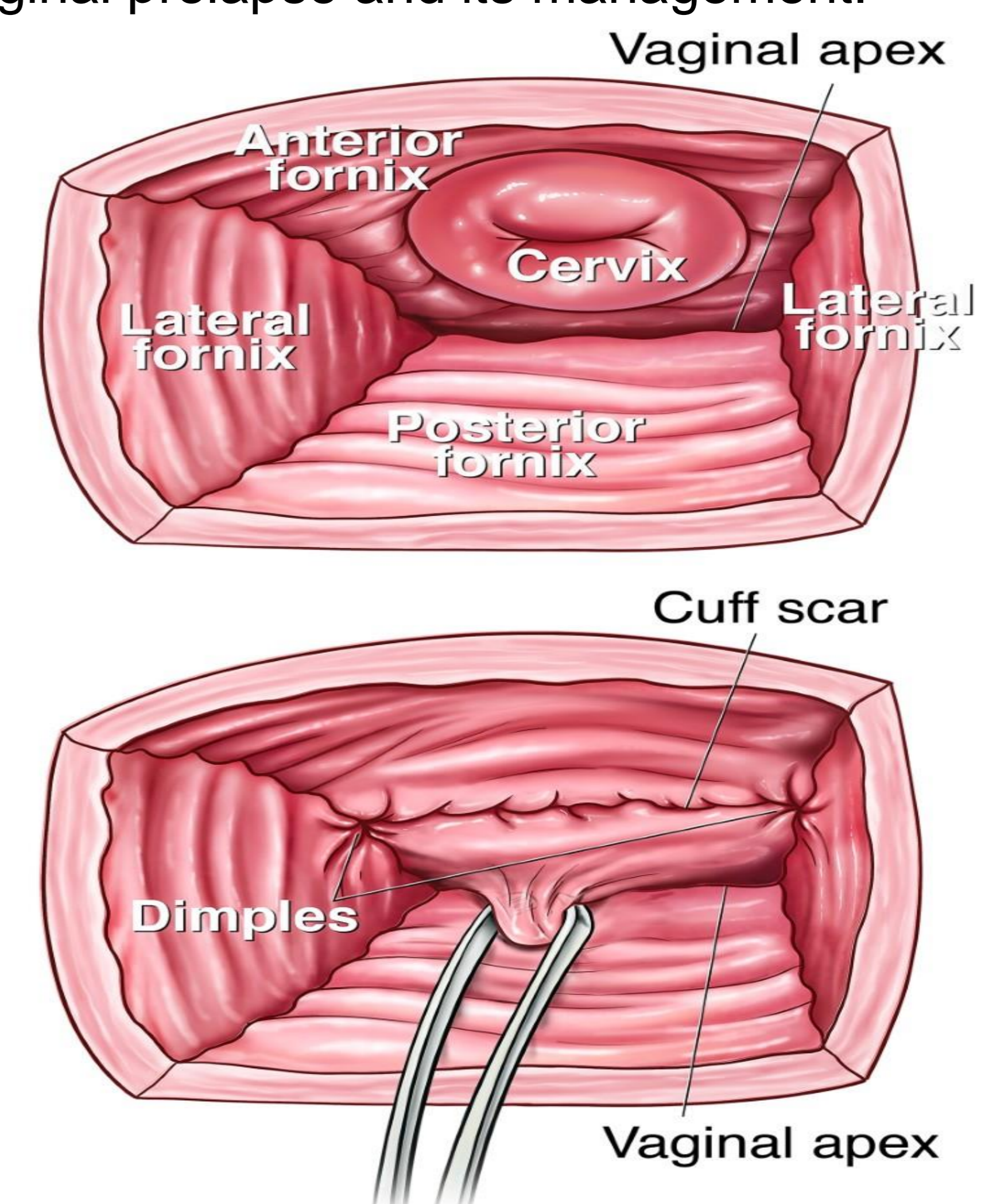


FIGURE 3: (top) VV Pre-hysterectomy; (bottom) VV post-hysterectomy

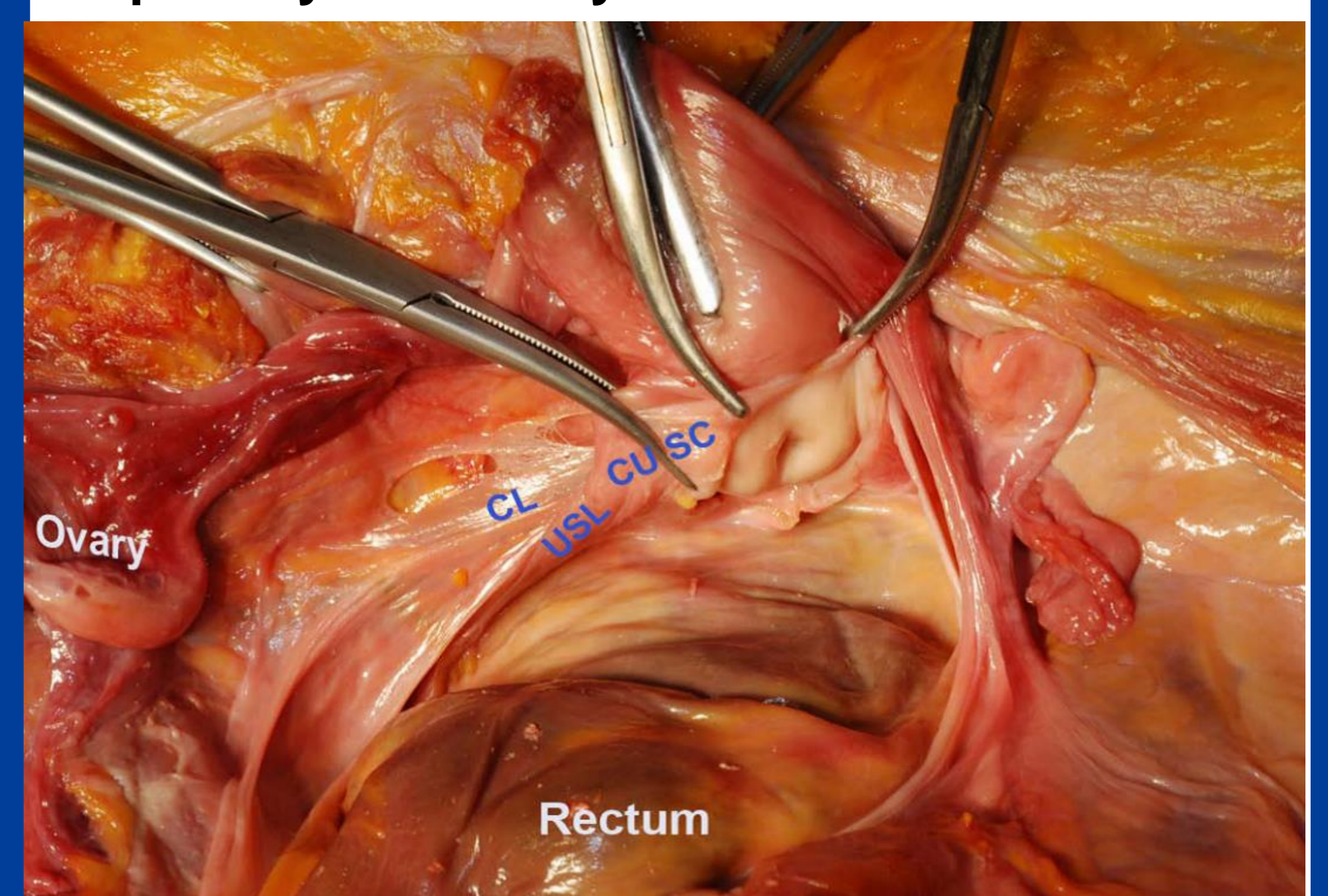


Figure 4: Cardinal ligament (CL) and Uterosacral (USL), at the VV, have their distal segments fuse together to create a Cardinal Utero-Sacral Complex (CUSC). From the cervix and VV, the CL passes postero-laterally whilst the USL passes supero-posteriorly.

References

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- 2: Haylen BT, Maher CF, Barber MD et al (2016) An International Urogynecological Association (IUGA) / International Continence Society (ICS) Joint report on the Terminology for Pelvic Organ Prolapse. Neurourol Urodyn 35(2):137-168.; Int Urogynecol J 27(2):165-194.
- 3: Haylen BT, Avery D, Chiu TL, Birrell W. Posterior repair quantification (PR-Q) using key anatomical indicators (KAI) – Preliminary Report. Int Urogynecol J. 2014;25:1665-1672.