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Educational video

Robotically assisted peritoneal mesometrial resection (PMMR) in endometrial cancer supported by ICG labeling of the compartmental lymphatic system

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Abstract

Lymphatic network is derived from embryonal veins and thus confined to the embryologically derived organ compartment (Ribatti and Crivellato, 2010; Yang and Oliver, 2015). Labeling the uterine lymphatic system may facilitate oncological surgery within the compartment borders of the corresponding morphogenetic fields (Dahmann et al., 2011; Höckel, 2015).

Before peritoneal mesometrial resection (PMMR) for endometrial cancer (Kimmig et al., 2013a, 2015) 4 × 0.5 ml of a 1.66 mg/ml Indocyanine green solution (ICG pulsion®, PMS SE, Feldkirchen, Germany) were injected into the uterine corpus. The fundal and midcorporal area was identified using an Iowa trumpet as a probe transcervically and ICG was applied at 3 and 9 o'clock, 5 mm in depth through the consecutively inserted needle.

The fluorescent lymphatic network of the uterine corpus is visualized including collecting and connecting vessels to the draining lymph compartments. The borders of the Müllerian uterine system, bladder and rectum compartments can clearly be identified by border lamella and the topical course of the lymphatic channels. Same is true with respect to the drainage along the vascular mesometrium and the infundibulopelvic ligament. Lymphatic drainage of the uterine corpus and cervix is partially different (Kimmig et al., 2016); this represents the anatomical basis for the differences in technique of PMMR compared to total mesometrial resection (TMMR) (Höckel et al., 2009; Kimmig et al., 2013b); pelvic part of robotic PMMR following ICG labeling using a da Vinci Xi system is demonstrated.

The compartment visualization by ICG may help the trainee to understand surgical anatomy and to improve the learning curve, the expert to adapt to individual situations. Furthermore, it enables to exactly define a surgical technique for scientific studies and clinical use.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.gore.2016.03.004.

References

Dahmann, C., Oates, A.C., Brand, M., 2011. Boundary formation and maintenance in tissue development. Nat. Rev. Genet. 12, 43–55.

Höckel, M., 2015. Morphogenetic fields of embryonic development in locoregional cancer spread. Lancet Oncol. 16 (3), e148–e151. http://dx.doi.org/10.1016/S1470-2045(14)71028-9 (Mar).

Höckel, M., Horn, L.-C., Manthey, N., et al., 2009. Resection of the embryologically defined uterovaginal (Müllerian) compartment and pelvic control in patients with cervical cancer: a prospective analysis. Lancet Oncol. 10, 683–692.

Kimmig, R., Aktas, B., Buderath, P., et al., 2013a. Definition of compartment-based radical surgery in uterine cancer: modified radical hysterectomy in intermediate/high-risk endometrial cancer using peritoneal mesometrial resection (PMMR) by M Höckel translated to robotic surgery. World J. Surg. Oncol. 11 (1), 198 (Aug 16).

Kimmig, R., Aktas, B., Buderath, P., Rusch, P., Heubner, M., 2016. Intraoperative navigation in robotically assisted compartmental surgery of uterine cancer by visualisation of embryologically derived lymphatic networks with Indocyanine-green (ICG). J. Surg. Oncol. http://dx.doi.org/10.1002/jso.24174 (Jan 21).

Kimmig, R., Wimberger, P., Buderath, P., et al., 2013b. Definition of compartment-based radical surgery in uterine cancer: radical hysterectomy in cervical cancer as 'total mesometrial resection (TMMR)' by Michael Höckel translated to robotic surgery (rTMMR). World J. Surg. Oncol. 11 (1), 211 (Aug 26).

Kimmig, R., Iannaccone, A., Aktas, B., et al., 2015. Embryologically based radical hysterectomy as peritoneal mesometrial resection (PMMR) with pelvic/paraaortic lymphadenectomy for loco-regional tumour control in endometrial cancer – first evidence for efficacy. Arch. Gynecol. Obstet. http://dx.doi.org/10.1007/s00404-015-3956-y.

Ribatti, D., Crivellato, E., 2010. The embryonic origins of lymphatic vessels: an historical review. Br. J. Haematol. 149, 669–674.

Yang, Y., Oliver, G., 2015. Development of the mammalian lymphatic vasculature. J. Clin. Investig. 124, 888–897.

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