

Keep Your Landmarks Close, And The Hypogastric Nerve Closer: An Approach To Nerve-Sparing Endometriosis Surgery

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PII: S1553-4650(19)30334-6  
DOI: <https://doi.org/10.1016/j.jmig.2019.08.001>  
Reference: JMIG 3896

To appear in: *The Journal of Minimally Invasive Gynecology*

Received date: 20 July 2019  
Revised date: 2 August 2019  
Accepted date: 2 August 2019

Please cite this article as: Andrew Zakhari MD , Mohamed Mabrouk MD, PhD ,  
Diego Raimondo MD , Manuela Mastronardi MD , Renato Seracchioli MD , Benedetta Mattei ,  
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Nucelio Lemos MD, PhD , Keep Your Landmarks Close, And The Hypogastric Nerve Closer: An  
Approach To Nerve-Sparing Endometriosis Surgery, *The Journal of Minimally Invasive Gynecology*  
(2019), doi: <https://doi.org/10.1016/j.jmig.2019.08.001>

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**Title:**

Keep Your Landmarks Close, And The Hypogastric Nerve Closer: An Approach To Nerve-Sparing Endometriosis Surgery

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**Conflict of interest:**

AZ received an honorarium from Hologic for an educational presentation, MJS is a consultant with Medtronic, and serves on the advisory board for Allergan and AbbVie, NL receives research support in the form of equipment for independent research from Medtronic and serves on the speaker's bureau for Medtronic and Laborie Inc.

**Funding:**

No funding was required for the completion of this project

**Prior presentation:**

1. Accepted for future presentation at the 2019 AAGL Global Congress on MIGS in Vancouver, Canada – November 2019
2. Accepted for future presentation at the 4<sup>th</sup> Annual Conference of the CanSAGE in Ottawa, Canada – September 2019

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**Clinical Trial Registry Number/IRB number:** N/A – IRB approval was not required

**Word Count:** 311

**Abstract****Objective:**

Excisional techniques used to surgically treat deeply infiltrating endometriosis (DIE) can result in inadvertent damage to the autonomic nervous system of the pelvis, leading to urinary, anorectal, and sexual dysfunction<sup>1-4</sup>. This educational video illustrates the autonomic neuroanatomy of the pelvis, identifying the predictable location of the hypogastric nerve in relation to other pelvic landmarks, and demonstrates a surgical technique for sparing the hypogastric nerve and inferior hypogastric plexus.

**Design:**

Using didactic schematics and medical drawings, we discuss and illustrate the autonomic neuroanatomy of the pelvis. With annotated laparoscopic footage, we demonstrate a stepwise approach for identifying, dissecting, and preserving the hypogastric nerve during pelvic surgery.

**Setting:**

Tertiary care academic hospitals: Mount Sinai Hospital in Toronto, Ontario – Canada, and S. Orsola Hospital in Bologna, Italy.

**Interventions:**

Radical excision of DIE with adequate identification and sparing of the hypogastric nerve and inferior hypogastric plexus bilaterally is performed, following an overview of pelvic neuroanatomy. The superior hypogastric plexus is described and the hypogastric nerve, the most superficial and readily identifiable component of the inferior hypogastric plexus, is identified and used as a landmark to preserve autonomic bundles in the pelvis.

The following steps, illustrated with laparoscopic footage, describe a surgical technique developed to identify and preserve the hypogastric nerve and the deeper inferior hypogastric plexus without the need for more extensive pelvic dissection to the level of the sacral nerve roots: 1) transperitoneal identification of the hypogastric nerve, with a pulling maneuver for confirmation, 2) opening of the retroperitoneum at the level of the pelvic brim and retroperitoneal identification of the ureter, 3) medial dissection and identification of the hypogastric nerve and 4) lateralization of the hypogastric nerve, allowing for safe resection of DIE.

**Conclusions:**

The hypogastric nerve follows a predictable course and can be identified, dissected, and spared during pelvic surgery, making it an important landmark for the preservation of pelvic autonomic innervation.

**Key words:** Endometriosis; hypogastric nerve; nerve-sparing surgery

**References:**

1. Daraï, Emile, et al. "Outcome of laparoscopic colorectal resection for endometriosis." *Current Opinion in Obstetrics and Gynecology* 19.4 (2007): 308-313.
2. Dubernard, Gil, et al. "Urinary complications after surgery for posterior deep infiltrating endometriosis are related to the extent of dissection and to uterosacral ligaments resection." *Journal of Minimally Invasive Gynecology* 15.2 (2008): 235-240.
3. Deffieux, X., et al. "Voiding dysfunction after surgical resection of deeply infiltrating endometriosis: pathophysiology and management." *Gynecologie, obstetrique & fertilité* 35 (2007): S8-13.
4. Armengol-Debeir, Laura, et al. "Pathophysiological approach to bowel dysfunction after segmental colorectal resection for deep endometriosis infiltrating the rectum: a preliminary study." *Human reproduction* 26.9 (2011): 2330-2335.

**Video legend:**

This video presents an overview of the pelvic autonomic nervous system using schematics and medical drawings, followed by surgical footage demonstrating a stepwise approach to identifying, dissecting, and sparing the hypogastric nerve and inferior hypogastric plexus during endometriosis surgery.