Evaluation of Nerve Management and Outcomes in Open Inguinal Hernia Repair

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Disclosures

William Hope, MD

- BD-Honorarium-Research/Consulting/Speaking
- WL Gore-Honorarium-Research/Consulting
- Medtronic-Honorarium-Consulting
- Intuitive-Honorarium-Research/Consulting
- Allergan-Honorarium-Research/Consulting
- TAS Medical-Surgeon Advisory Board
- Deep Blue-Surgeon Advisory Board
- Absolutions-Surgeon Advisory Board

Justin Leavitt, MD

- None

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Chronic Pain After Inguinal Hernia Surgery

Chronic Pain

10% to 12%
Groin pain or discomfort as high as 40%

Neuropathic
Nerve injury
Tissue injury
Inflammation

3 months
Consider up to 6-months following hernia surgery

Risks

Younger age

Recurrent hernias

Female

High pre-op pain
History of chronic pain

Kumar S, et al. Chronic pain after laparoscopic and open mesh repair of groin hernia. *Br J Surg*. 2002
Bande D, et al. Chronic pain after groin hernia repair: pain characteristics and impact on quality of life. *BMC Surg*. 2020
Reinpold W. Risk factors of chronic pain after inguinal hernia repair: a systematic review. Innov Surg Sci. 2017

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Chronic Pain – Surgical Risk Factors

Open vs laparoscopic

Open 10% to 12%

Laparoscopic 1% to 4%

Mesh

Usage

Type

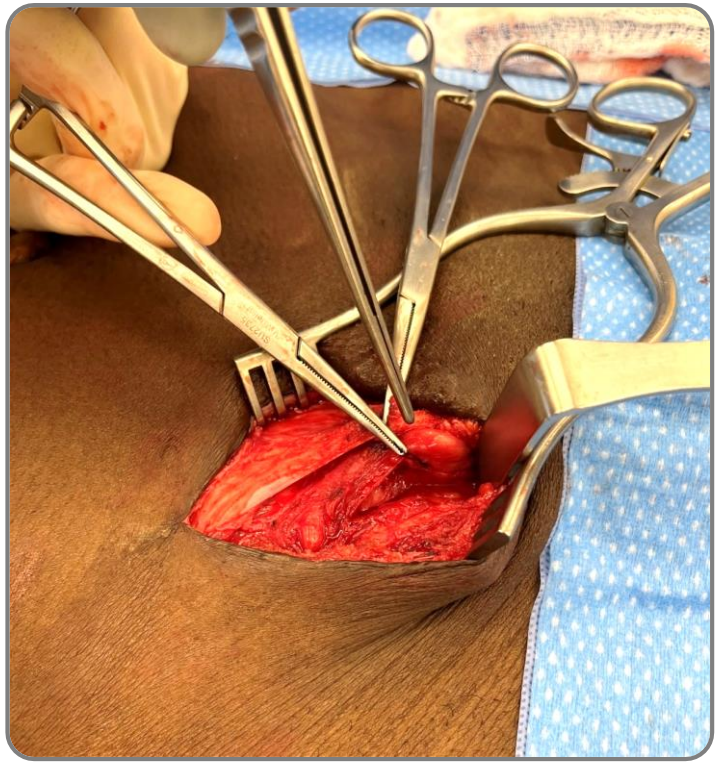
Placement

Nerve management

Identification

Preservation

Prophylactic or pragmatic resection



Kumar S, et al. Chronic pain after laparoscopic and open mesh repair of groin hernia. *Br J Surg*. 2002

Mahon D, Decadt B, Rhodes M. Prospective randomized trial of laparoscopic (transabdominal preperitoneal) vs open (mesh) repair for bilateral and recurrent inguinal hernia. *Surg Endosc*. 2003

Reinpold W. Risk factors of chronic pain after inguinal hernia repair: a systematic review. Innov Surg Sci. 2017

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Nerve Management

HerniaSurge 2018

Not recommended:

- Planned IIN or IHN resection

Recommended:

- Pragmatic resection

Alfieri (2006) multicenter prospective:

- 0% chronic pain: no resection
- 40% chronic pain: all 3 resected

Hsu (2012) meta-analysis of 5 RCTs:

- No significant difference in pain at 6- and 12- months

Cirocchi (2021) Meta-analysis of 16 RCTs

- Ilioinguinal preservation: 25.11%
- Ilioinguinal neurectomy: 8.94%

HerniaSurge Group. International guidelines for groin hernia management. Hernia. 2018
Alfieri S, et al. Influence of preservation versus division of ilioinguinal, iliohypogastric, and genital nerves during open mesh herniorrhaphy. Ann Surg. 2006
Hsu W, et al. Preservation versus division of ilioinguinal nerve on open mesh repair of inguinal hernia: a meta-analysis. World J Surg. 2012
Cirocchi R, et al**. Ilioinguinal Nerve Neurectomy is better than Preservation in Lichtenstein Hernia Repair**: A Systematic Literature Review and Meta-analysis. World J Surg. 2021

Design

ACHQC data, 2014-2023

Inclusion

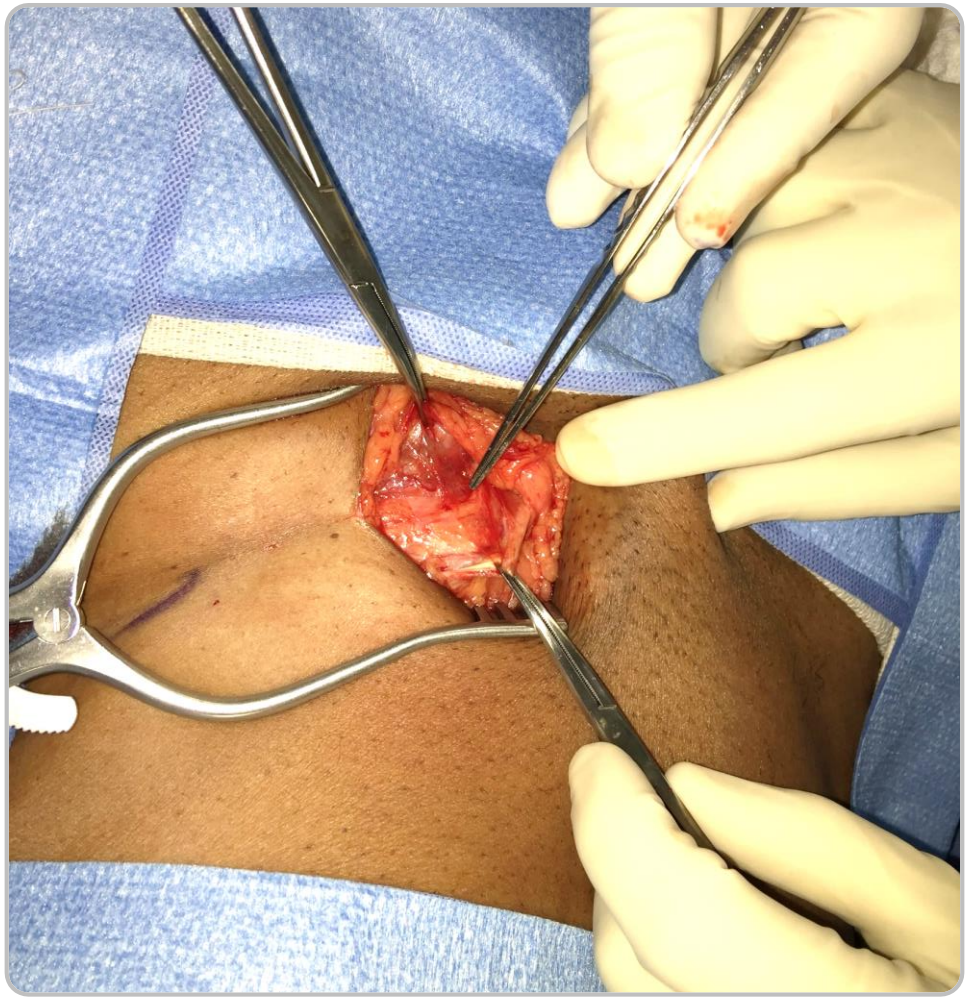
- Age 18 and older
- Open inguinal hernia repair with mesh
- Any nerve identified during surgery

Exclusion

- No nerve management data
- Nerve not identified

Analyses

- Unmatched comparison of nerve management
- Propensity score matching



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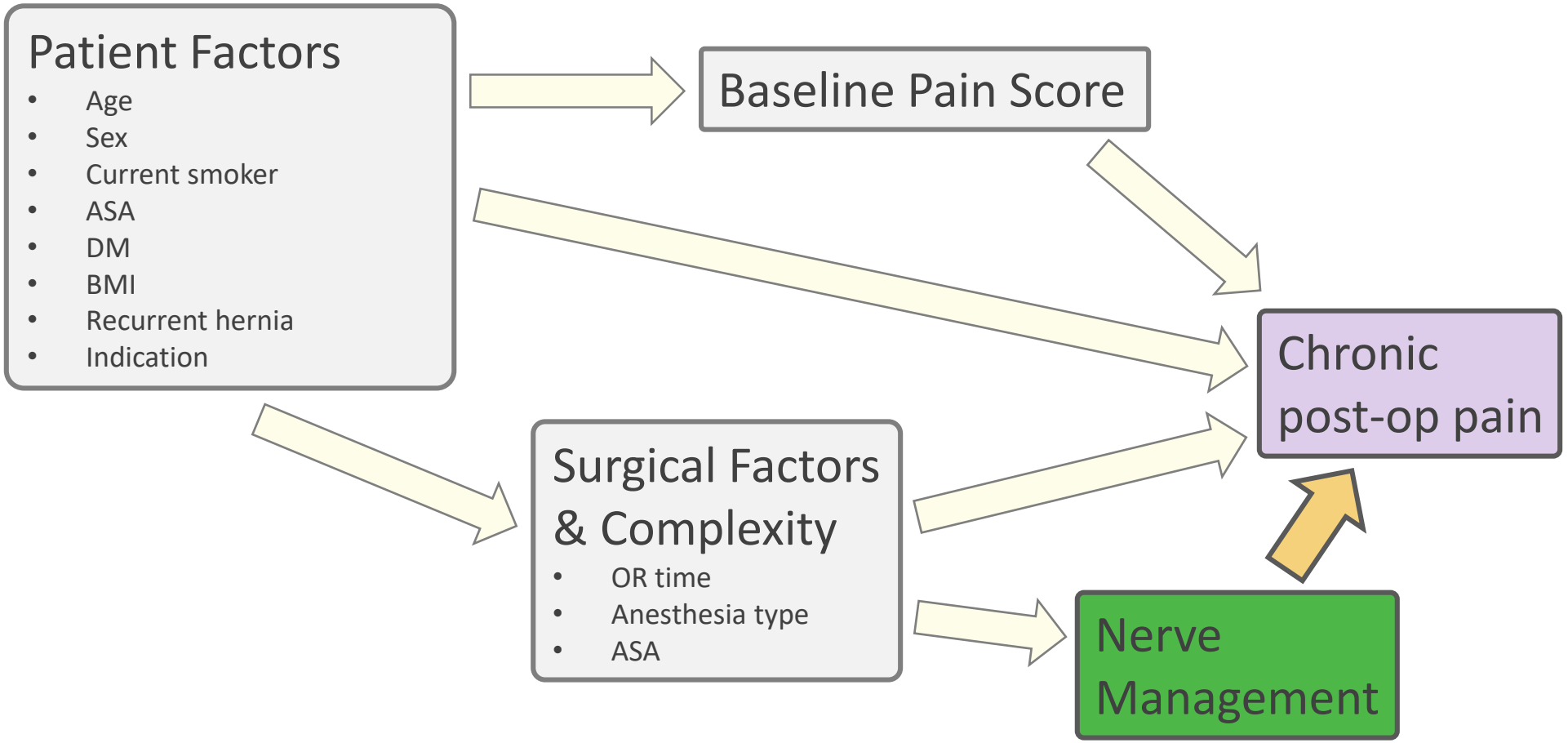
Causal Diagram



Propensity score matching

Patient characteristic variables:

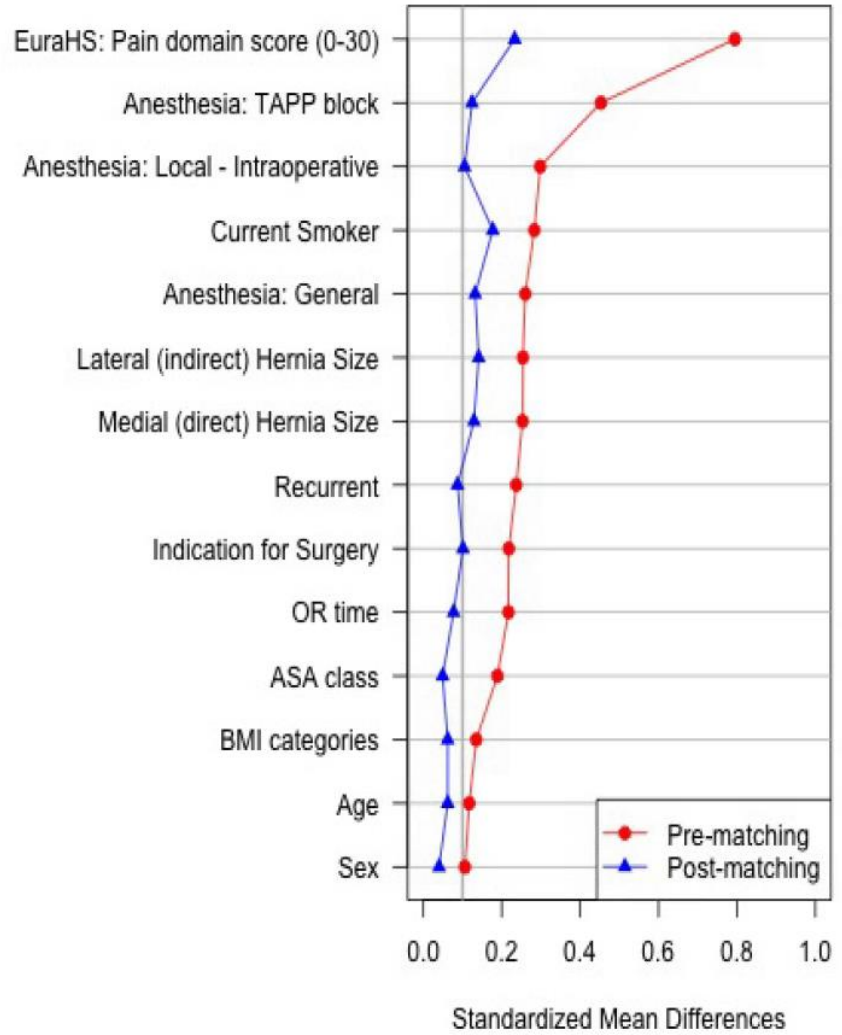
- Age
- Gender
- Current smoker
- ASA
- DM
- BMI
- Recurrent hernia
- Baseline pain score

Surgical variables:

- OR time
- Indication
- Hernia size
- Anesthesia general
- Anesthesia local
- Anesthesia TAPP

Outcome variable:

- Chronic pain: EuraHS pain ≥ 6 (0 to 30) 6- or 12-month PRO



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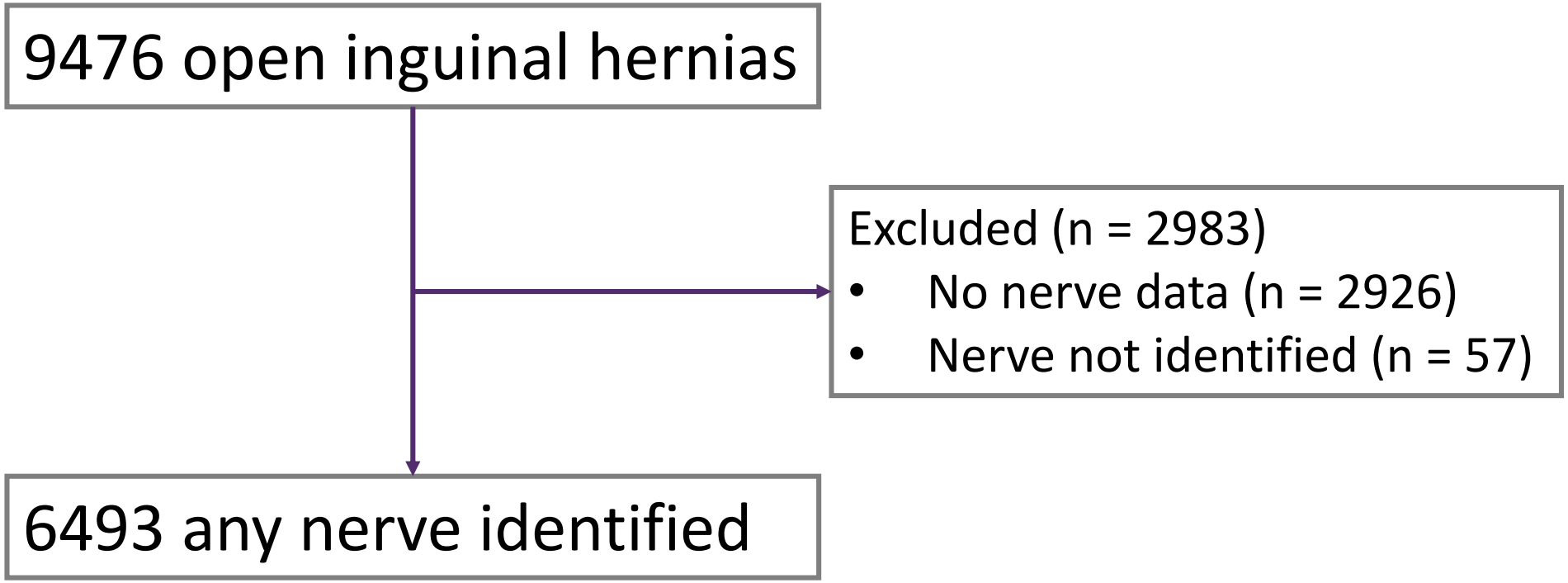
Results


9476 open inguinal hernias
Excluded (n = 2983)
• No nerve data (n = 2926)
• Nerve not identified (n = 57)
6493 any nerve identified

Patient Characteristics

		Protected – Left in Situ (n = 4828)	Replaced in Situ (n = 348)	Partially Excised (n = 540)	Fully Excised (n = 777)	Total (n = 6493)	*P* value
Sex	Female	**381 (8%)**	**30 (9%)**	**69 (13%)**	**88 (11%)**	568 (9%)	<0.001
	Male	**4447 (92%)**	**318 (91%)**	**471 (87%)**	**689 (89%)**	5925 (91%)	
Age		**66 [55, 74]**	**67 [57, 75]**	**65 [56, 74]**	**63 [52, 73]**		0.007
BMI		**26 [23, 28]**	**26 [23, 28]**	**26 [23, 28]**	**26 [24, 30]**		<0.001
DM	No	**4431 (92%)**	**315 (91%)**	**478 (89%)**	**686 (88%)**	5910 (91%)	0.002
	Yes	**397 (8%)**	**33 (9%)**	**62 (11%)**	**91 (12%)**	583 (9%)	

Fully Excised: Female: 88/568 (15.5%) Male: 689/5925 (11.6%)

Not significant: recurrent, smoking, HTN

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Operative Details

		Protected – Left in Situ (n = 4823)	Replaced in Situ (n = 348)	Partially Excised (n = 540)	Fully Excised (n = 777)	Total (n = 6493)	*P* value
OR Time	No	**2968 (62%)**	**230 (66%)**	**265 (49%)**	**362 (47%)**	3825 (59%)	<0.001
> 1 Hour	Yes	**1855 (38%)**	**118 (34%)**	**275 (51%)**	**415 (53%)**	2663 (41%)	
OR time	No	**4616 (96%)**	**337 (97%)**	**502 (93%)**	**698 (90%)**	6153 (95%)	<0.001
> 2 Hour	Yes	**212 (4%)**	**11 (3%)**	**38 (7%)**	**79 (10%)**	340 (5%)	

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30D Outcomes

		Protected – Left in Situ (n = 4823)	Replaced in Situ (n = 348)	Partially Excised (n = 540)	Fully Excised (n = 777)	Total (n = 6493)	*P* value
SSI/SSO	No	**4653 (96%)**	**336 (97%)**	**502 (93%)**	**736 (95%)**	6227 (96%)	<0.001
	Yes	**175 (4%)**	**12 (3%)**	**38 (7%)**	**41 (5%)**	266 (4%)	
Procedure	No	**4806 (100%)**	**346 (99%)**	**536 (9950**	**769 (99%)**	6457 (99%)	0.22
	Yes	**22 (0%)**	**2 (1%)**	**4 (1%)**	**8 (1%)**	36 (1%)	
Re-Admit	No	**4790 (99%)**	**344 (99%)**	**533 (99%)**	**763 (98%)**	6430 (99%)	0.046
	Yes	**38 (1%)**	**4 (1%)**	**7 (1%)**	**14 (2%)***	63 (1%)	

*Most common reason was pain or wound complication.

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Patient Reported Outcomes

	N	Protected – Left in Situ	Replaced in Situ	Partially Excised	Fully Excised	*P* value
Baseline pain (0-30)	3587	**6 [2, 13]**	**9 [4, 14]**	**6 [2, 13]**	**11 [5, 18]**	<0.001
30d pain (0-30)	4729	**3 [0, 7]**	**4 [1, 9]**	**4 [0, 8]**	**4 [1, 10]**	<0.001
1 year pain (0-30)	1634	**0.0 [0.0, 2.0]**	**0.0 [0.0, 2.0]**	**0.0 [0.0, 2.8]**	**0.0 [0.0, 4.0]**	0.047

Pain: In rest (0-10), during activities (0-10), worst pain felt during the last week (0-10)

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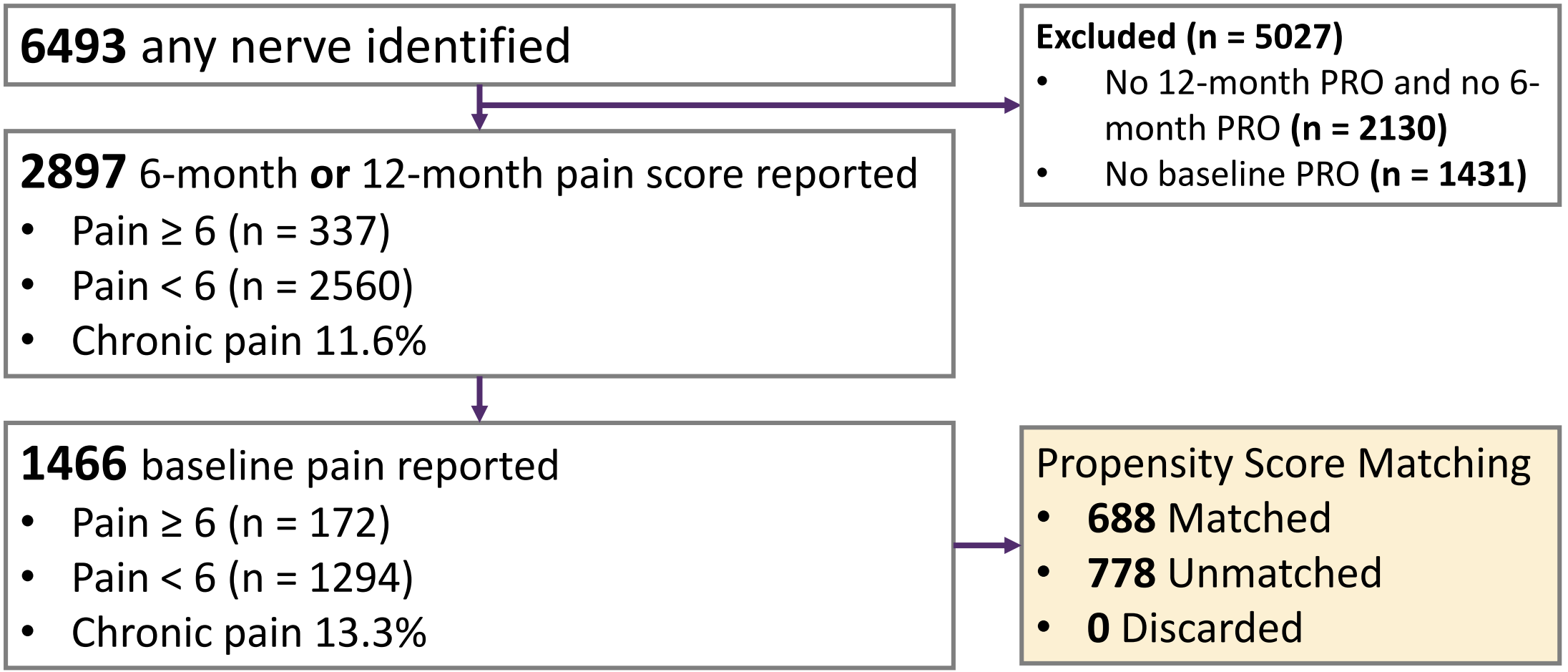
Propensity Score Analysis



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Matched Outcomes

		Pain < 6 (n = 516)	Pain ≥ 6 (n 172)	*P* value
Any Nerve ID	No	**181 (35%)**	**53 (31%)**	0.31
	Yes	**335 (65%)**	**119 (69%)**	

		Pain < 6 (n = 302)	Pain ≥ 6 (n = 109)	*P* value
Ilioinguinal	Protected	**156 (52%)**	**46 (42%)**	0.002
	Replaced	**45 (15%)**	**6 (6%)**	
	Partially Excised	**12 (4%)**	**9 (8%)**	
	Fully Excised	**89 (29%)**	**48 (44%)**	

		Pain < 6 (n = 170)	Pain ≥ 6 (n = 59)	*P* value
Iliohypogastric	Protected	**127 (75%)**	**31 (53%)**	0.003
	Replaced	**11 (6%)**	**4 (7%)**	
	Partially Excised	**5 (3%)**	**1 (2%)**	
	Fully Excised	**27 (16%)**	**23 (39%)**	

		Pain < 6 (n = 117)	Pain ≥ 6 (n = 42)	*P* value
Gen Br. of GF	Protected	**48 (41%)**	**13 (31%)**	0.28
	Replaced	**3 (3%)**	**1 (2%)**	
	Partially Excised	**30 (26%)**	**8 (19%)**	
	Fully Excised	**36 (31%)**	**20 (48%)**	

Matched Outcomes

	N	Pain < 6	Pain ≥ 6	*P* value
30d pain (0-30)	603	**3 [0, 6]**	**8 [4, 15]**	<0.001
1 year pain (0-30)	363	**0 [0, 2]**	**10 [6, 22]**	<0.001

Pain: In rest (0-10), during activities (0-10), worst pain felt during the last week (0-10)

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Conclusions

Results:

- Partial/full excision more common in females
- Excision associated with longer OR cases
- Patients with chronic pain more likely to have had nerve resection
- EuraHS pain ≥ 6 rate 11.6%

Limitations:

- Did not stratify open techniques
- Chronic pain definition, no definitions of mild-severe
- Other confounding factors still possible

Thank you to Sharon Phillips and the statistics team at Vanderbilt University

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Appendix

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ABDOMINAL CORE HEALTH QUALITY COLLABORATIVE
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Indication

		Protected – Left in Situ (n = 4828)	Replaced in Situ (n = 348)	Partially Excised (n = 540)	Fully Excised (n = 777)	Total (n = 6493)	*P* value
Enlarging	No	**3944 (82%)**	**258 (74%)**	**479 (89%)**	**677 (87%)**	5358 (83%)	<0.001
	Yes	**884 (18%)**	**90 (26%)**	**61 (11%)**	**100 (13%)**	1135 (17%)	
Painful bulge	No	**632 (13%)**	**61 (18%)**	**73 (14%)**	**204 (26%)**	970 (15%)	<0.001
	Yes	**4196 (87%)**	**287 (82%)**	**467 (86%)**	**573 (74%)**	5523 (85%)	
CPIP	No	**4804 (100%)**	**348 (100%)**	**523 (97%)**	**667 (86%)**	6342 (98%)	<0.001
	Yes	**24 (0%)**	**0**	**17 (3%)**	**110 (14%)**	151 (2%)	

CPIP: Chronic postoperative inguinal pain

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