Pre-operative Lumbar Plexus Block Provides Superior Post-operative Analgesia when compared with Fascia Iliaca Block or General Anesthesia alone in Hip Arthroscopy

Andrew B. Wolff, MD[a]
Geoffrey Hogan, BA[a]
James Capon, BS, MS[a]
Hayden Smith, BA[a]
Alexandra Napoli, BS[a]
Patrick Gaspar, MD[b]

[a]Washington Orthopaedics and Sports Medicine, Washington DC;
[b]Reston Anesthesia Associates, Reston, VA

WOSM
WASHINGTON ORTHOPAEDICS & SPORTS MEDICINE

Andrew B. Wolff, MD

- I have the following financial relationships to disclose:
  - Consultant: Stryker

Background and Rationale

- Optimal anesthesia for arthroscopic surgery of the hip has yet to be defined

Background and Rationale

- Considerations specific to hip arthroscopy include:
  - Control of intra-operative pain
  - Adequate muscle relaxation to allow for distraction for work in the central compartment
  - Post-operative pain control

Background and Rationale

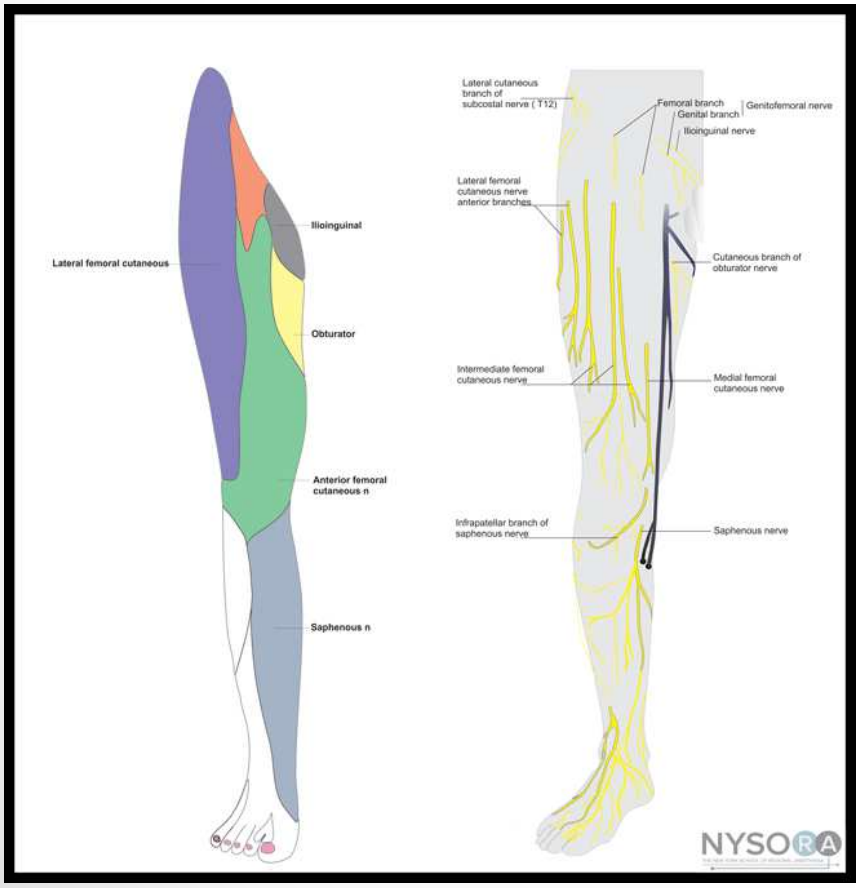
- We sought to compare general anesthesia alone to general anesthesia preceded by 2 different nerve blocks:
  - Fascia Iliaca block
  - Lumbar Plexus Block

Hip Innervation

- The hip joint is innervated by the femoral nerve, obturator nerve, the sacral plexus via the nerve to the quadratus femoris, and at times, directly via the sciatic nerve [1]

- The anterior portion of the hip joint is innervated by the Femoral and Obturator Nerves

- The anterolateral thigh is innervated by the Lateral Femoral Cutaneous Nerve



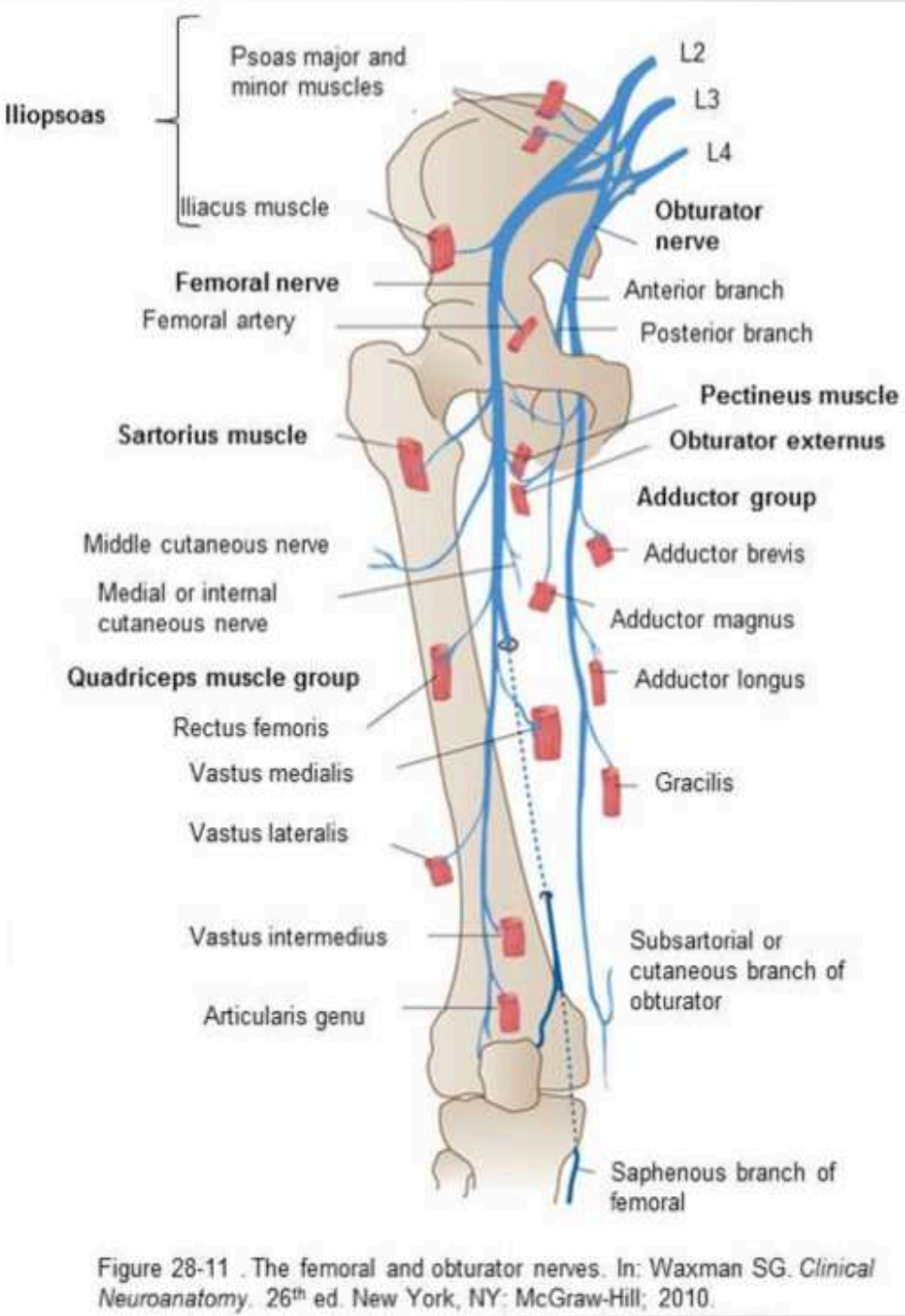
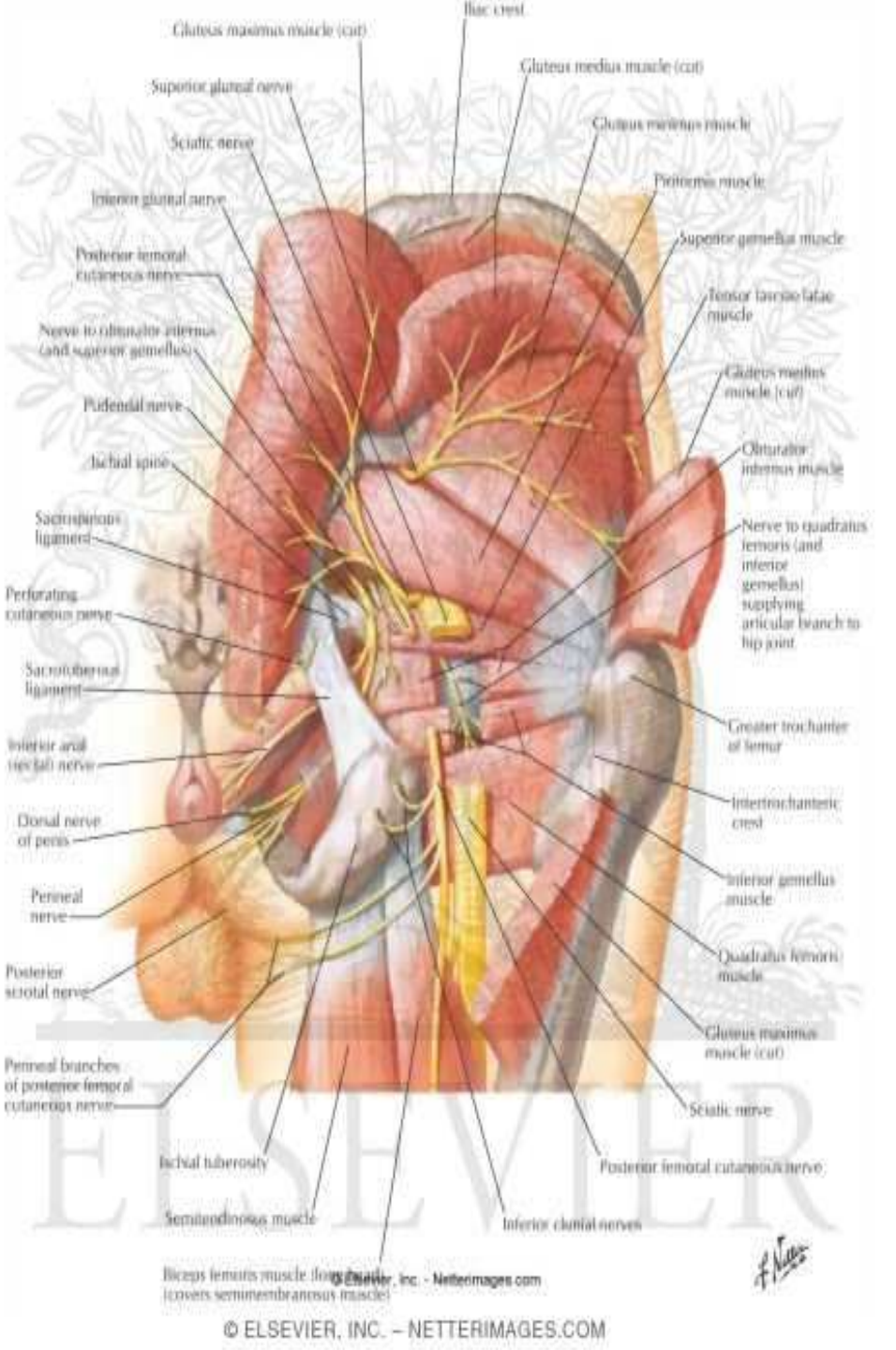


Figure 28-11 . The femoral and obturator nerves. In: Waxman SG. *Clinical Neuroanatomy*. 26th ed. New York, NY: McGraw-Hill; 2010.

- The posterior portion of the hip joint is innervated by the:
  - Nerve to the Quadratus Femoris
  - The Superior Gluteal Nerve
  - Directly via the Sciatic Nerve



Lumbar Plexus Blockade Reduces Pain After Hip Arthroscopy: A Prospective Randomized Controlled Trial

Jacques T. YaDeau, MD, PhD,* Tiffany Tedore, MD,‡ Enrique A. Goytizolo, MD,* David H. Kim, MD,* Douglas S. T. Green, MD,* Anna Westrick, MD,* Randall Fan, MD,‡ Matthew C. Rade, BA,* Anil S. Ranawat, MD,†§ Struan H. Coleman, MD, PhD,† and Bryan T. Kelly, MD†§

From the Departments of *Anesthesiology and †Orthopaedic Surgery, Hospital for Special Surgery; and Departments of ‡Anesthesiology and §Orthopaedic Surgery, New York–Presbyterian Hospital, Weill Cornell Medical College, New York, New York.

- Compared Spinal Epidural to Spinal Epidural plus lumbar plexus block
- Statistically significant decrease in PACU pain scores (-0.9 on 0-10 scale)

Preoperative Femoral Nerve Block for Hip Arthroscopy

A Randomized, Triple-Masked Controlled Trial

Jerry G. Xing,*† MD, MSc, FRCSC, Faraj W. Abdallah,‡ MD, Richard Brull,§ MD, FRCPC, Stephanie Oldfield,§ Andrew Dold,† MD, M. Lucas Murnaghan,‖ MD, MEd, FRCSC, and Daniel B. Whelan,¶ MD, FRCSC
Investigation performed at Women's College Hospital, Toronto, Ontario, Canada

- Significantly lower pain up to 6 hours post-operatively
- 6 of 27 patients in the femoral nerve block group reported falls in the first 24 hours post-operatively

Fascia Iliaca Block

- Provides Femoral and Lateral Femoral Cutaneous Nerve blockade

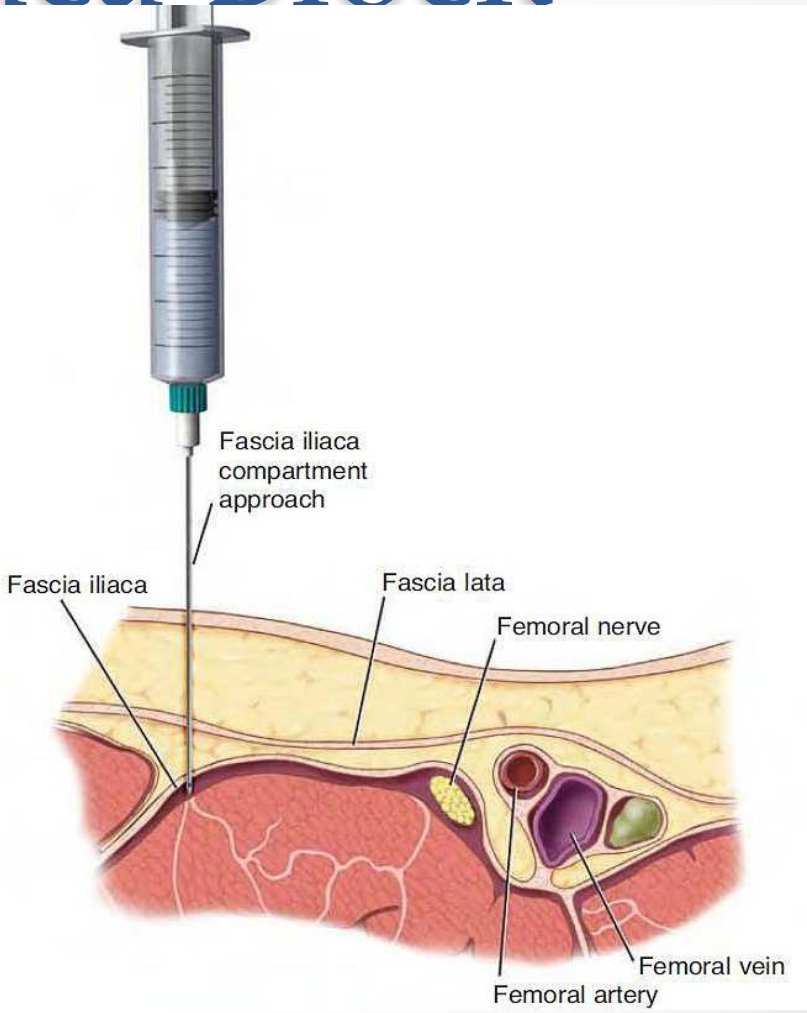
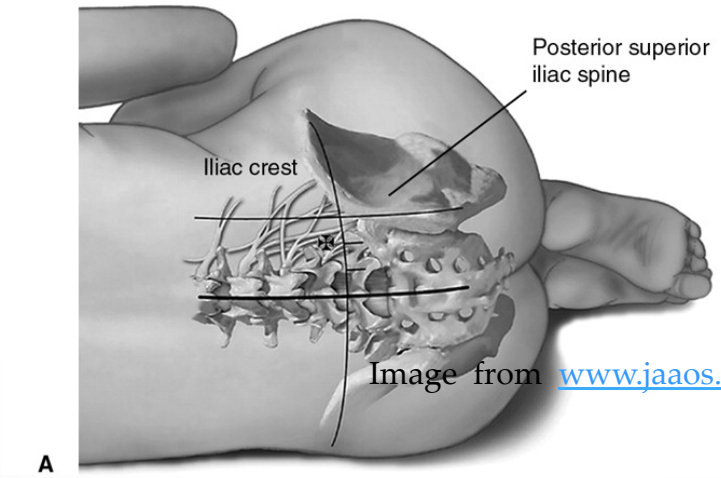


Image from Portmouth Anaesthesia accessed 10/6/14. http://usfa.co.uk/?p=85

Lumbar Plexus Block

- Provides Femoral, Lateral Femoral Cutaneous, and Obturator nerve blockade



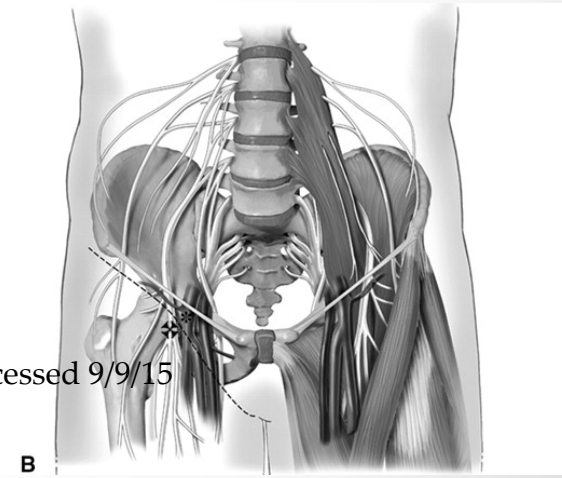


Image from www.jaaos.org accessed 9/9/15

Materials and Methods

- Retrospective chart review
- 145 consecutive patients who underwent arthroscopic hip surgery
- Single surgeon
- Single ambulatory surgery center
- Three anesthesiologists

Materials and Methods

- Anesthesiologists performed all pre-operative fascia iliaca blocks under ultrasound
- Goal is a medial to lateral spread of loca anesthetic underneath the fascia iliaca.

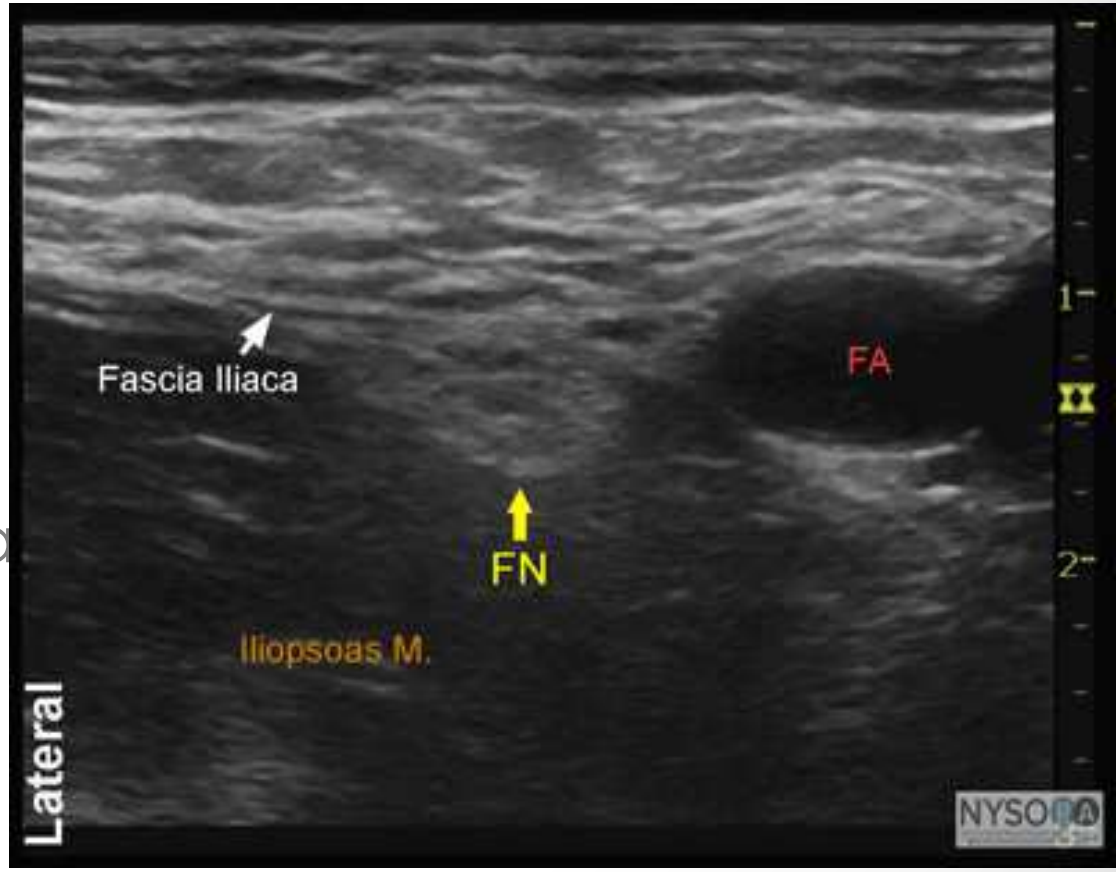


Image from www.nysora.com accessed 10/9/14.

Materials and Methods

- Anesthesiologist performed all pre-operative lumbar plexus blocks under ultrasound
- Goal is dispersion of anesthetic in a fascial plane within the psoas muscle where plexus roots are situated

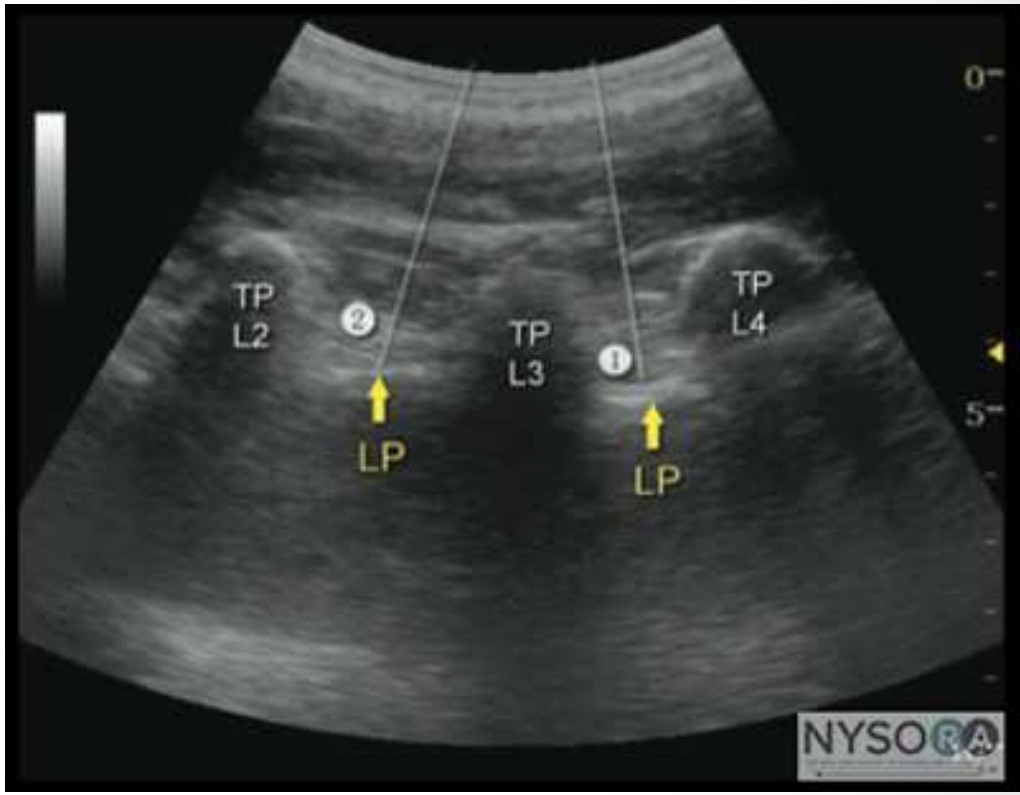


Image from www.nysora.com accessed 9/9/15.

Materials and Methods

- The local anesthetic used for both techniques was 40 mL 0.2% Ropivacaine with 4 mg of preservative free Decadron
- Post-op knee immobilizer used to prevent falls due to Femoral Nerve motor blockade

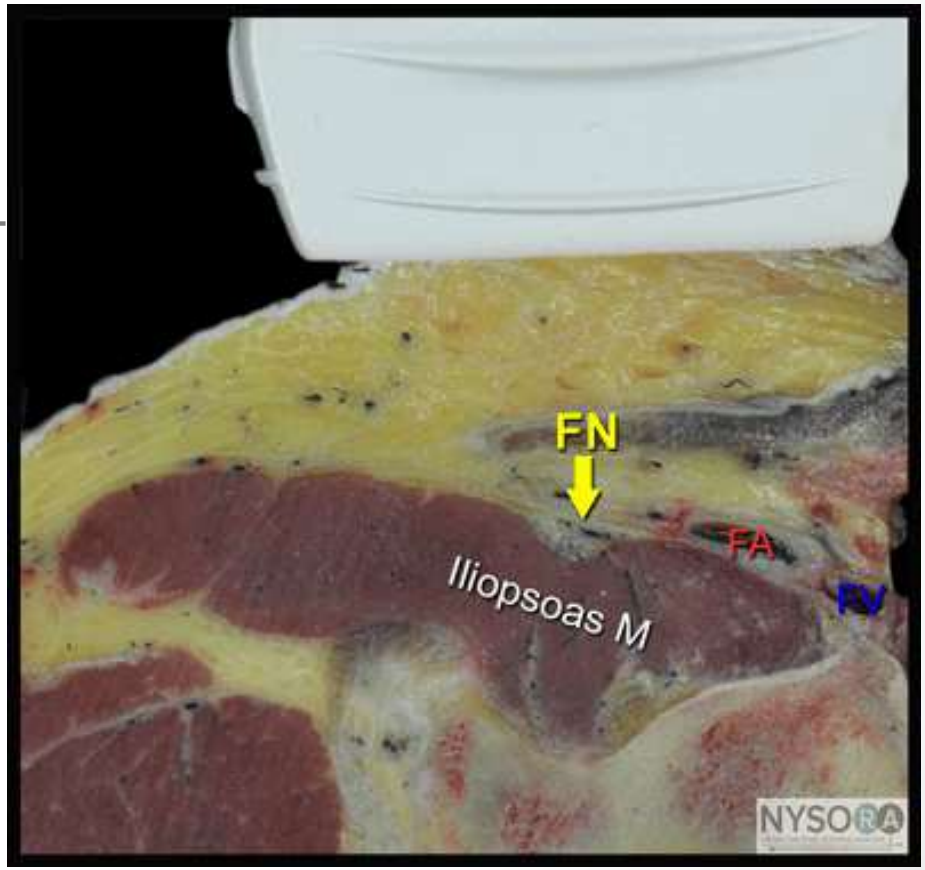


Image from www.nysora.com accessed 10/9/14.

Materials and Methods

- The first 55 procedures performed under general anesthesia alone.
- The subsequent 30 procedures underwent a fascia iliaca block prior to general anesthesia.
- A third cohort of 60 procedures received lumbar plexus blockade prior to GA.

Materials and Methods

- Groups were compared with respect to:
  - Gender
  - Age
  - Procedure performed
  - Pain scores (0-10 scale) recorded at 0, 30, 60, 90 and 120 minutes postoperatively in the post-anesthesia care unit (PACU)
  - Total morphine-equivalent dose in the PACU
  - Time to discharge
  - Presence of nausea in the PACU requiring anti-emetic medication

Materials and Methods

- Groups were compared against one another using a two-tailed, unequal sample size and unequal variance independent sample Student's t-test with regards to continuous demographic and postoperative data.
- Chi Square analysis was employed for categorical data
- Pain scores were further analyzed to control for covariate pre-operative pain using ANCOVA
- For the data analysis in this study, a p-value less than 0.05 was determined to be statistically significant signifying that a difference between the two experimental groups exists.

Results

Table 1: Patient Characteristics

	Gen (n=55)	Gen + FI (n=30)	Gen + LPB (n=60)
Sex, n			
Male	18	11	19
Female	37	19	41
Age, mean ± Std Err	34.51 ± 1.55	30.17 ± 2.47	35.45 ± 1.61
Mean Height (m)	1.69	1.69	1.7
Mean Weight (kg)	70.39	67.84	70.19
Mean BMI (kg/m^2)	24.22	23.59	24.18
Procedure Type, n (%)			
Femoral Osteoplasty	47 (85.5)	21 (73.3)	51 (86.7)
Acetabular Osteoplasty	23 (41.8)	9 (30)	23 (38.3)
No Osteoplasty	7 (12.7)	8 (26.7)	8 (13.3)
Labral Repair	33 (60)	24 (80)	30 (50)
Labral Reconstruction	18 (32.7)	4 (13.3)	22(36.7)
Labral Debridement	6 (10.9)	2 (6.7)	11 (18.3)
Capsular Plication	32 (58.2)	13 (43.3)	18 (30)
Glut min/med Repair	0 (0)	1 (3.3)	2 (3.3)

Results

Table 3. Pre-Operative and PACU Pain Scales

	Gen		Gen + FI			95% CI of difference	
Variable	μ ± Std Err	n	μ ± Std Err	n	p-value	Lower	Upper
Pre-Op Pain	2.36±0.35	55	2.73±0.44	30	0.512[a]	-1.49	0.751
Pain in PACU							
t=0	3.25±0.45	55	4.12±0.72	30	0.313[a]	-2.559	0.835
t=30	4.1±0.39	55	4.72±0.58	30	0.382[a]	-2.018	0.785
t=60	3.62±0.33	54	4.08±0.48	30	0.431[a]	-1.632	0.706
t=90	3.32±0.37	37	3.5±0.4	30	0.749[a]	-1.27	0.918
t=120	3.08±0.49	18	3.85±0.74	13	0.400[a]	-2.6	1.075

Table 4. Pre-Operative and PACU Pain Scales

	Gen		Gen + LPB		p-value	95% CI of difference	
Variable	μ ± Std Err	n	μ ± Std Err	n		Lower	Upper
Pre-Op Pain	2.36±0.35	55	2.63±0.3	60	0.561[a]	-1.187	0.648
Pain in PACU							
t=0	3.25±0.45	55	2.03±0.39	60	0.042[a]	0.042	2.4
t=30	4.1±0.39	55	3.08±0.40	60	0.069[a]	-0.08	2.113
t=60	3.62±0.33	54	2.57±0.29	60	0.019[a]	0.175	1.932
t=90	3.32±0.37	37	2.16±0.29	49	0.017[a]	0.216	2.106
t=120	3.08±0.49	18	1.57±0.38	28	0.019[a]	0.262	2.762

Independent sample Student's t-test results for post-operative pain scores

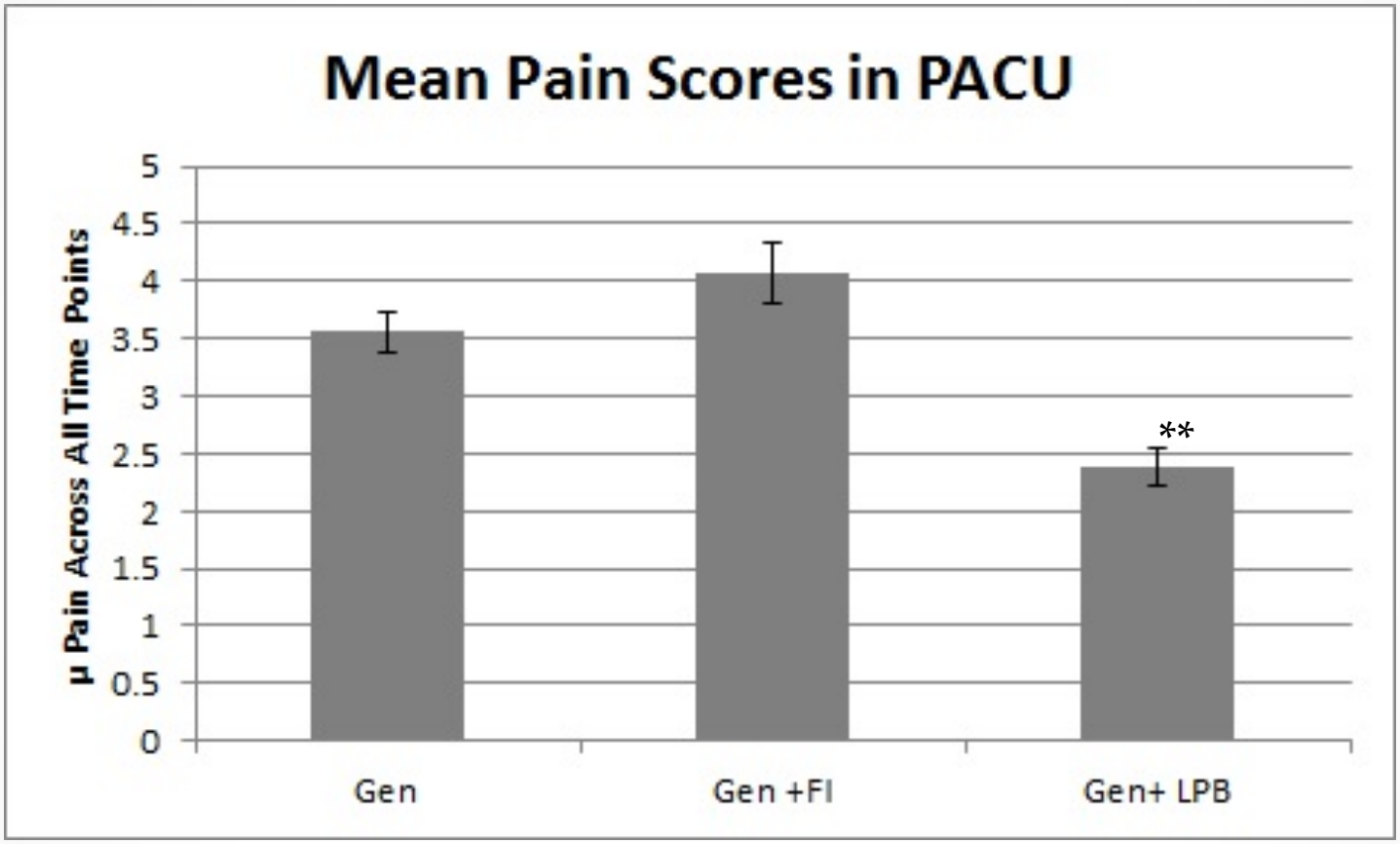
Results

Table 2. Pre-Operative and PACU Pain Scales

	Gen		Gen + FI		Gen + LPB		p-value	F-Ratio
Variable	**μ ± Std Err**	**n**	**μ ± Std Err**	**n**	**μ ± SD**	**n**		
Pre-Op Pain	2.36±0.35	55	2.73±0.44	30	2.63±0.3	60	0.759[b]	0.276
Pain in PACU								
t=0	3.25±0.45	55	4.12±0.72	30	2.03±0.39	60	0.019[c]	4.081[#]
t=30	4.1±0.39	55	4.72±0.58	30	3.08±0.40	60	0.038[c]	3.362[#]
t=60	3.62±0.33	54	4.08±0.48	30	2.57±0.29	60	0.013[c]	4.455[#]
t=90	3.32±0.37	37	3.5±0.4	30	2.16±0.29	49	0.017[c]	4.238[#]
t=120	3.08±0.49	18	3.85±0.74	13	1.57±0.38	28	0.001[c]	7.498[#]

- ANOVA[b] and ANCOVA[c] results. Analysis of covariance controlling for covariate pre-operative pain.

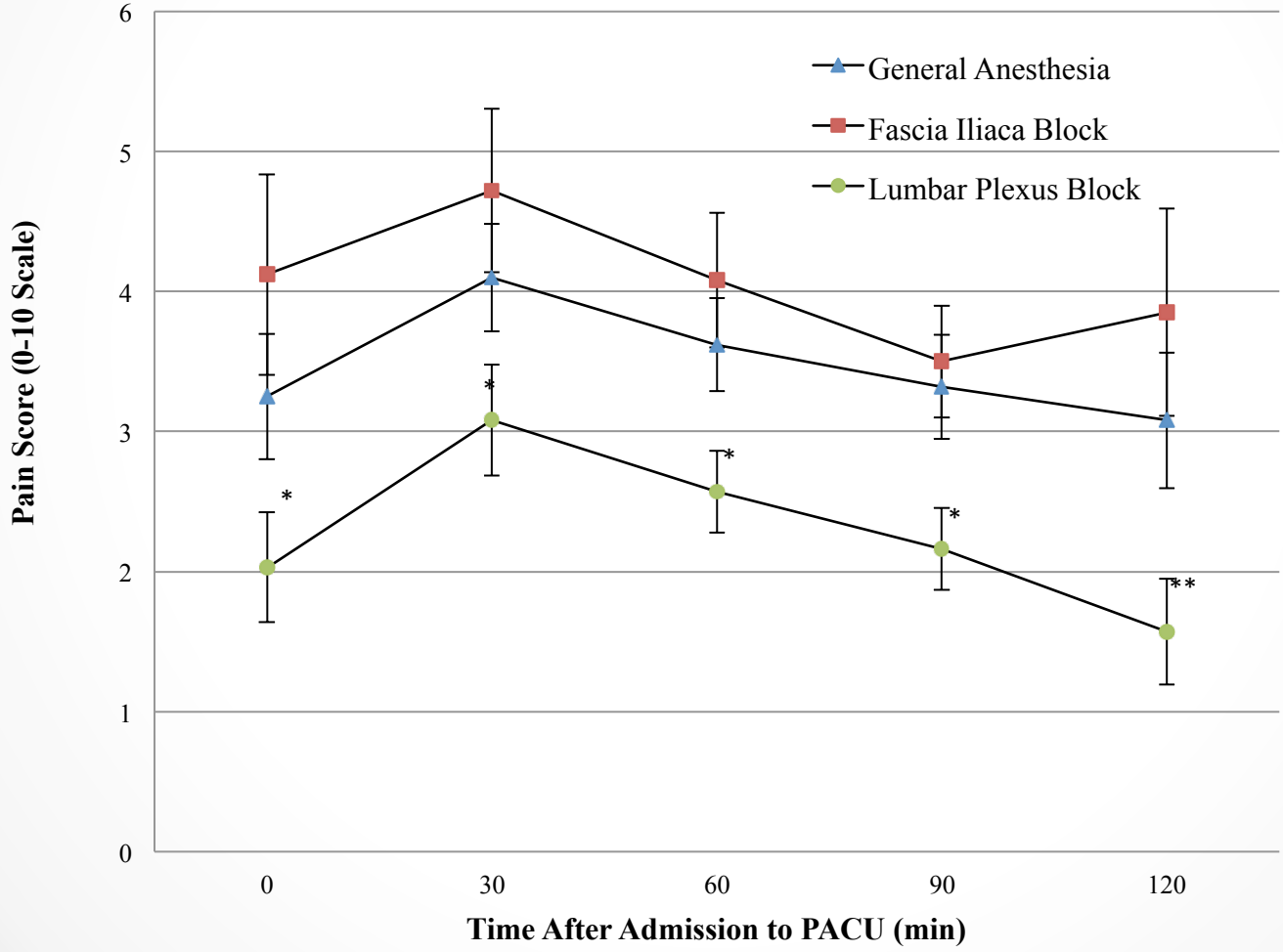
Results



Pain Scores averaged across all time intervals in PACU.
Error bars represent standard error of the mean.

Results

Pain Scores in PACU



Results

- No difference in morphine-equivalent dosage
- No difference in time to discharge
- No difference in nausea requiring anti-emetics

Results

- No complications in Gen or FI groups
- There were no falls in either group
- There was a seizure of ~10 seconds in one patient in the LPB group
  - Patient was closely monitored and had no drop in oxygen saturation or blood pressure, no arrhythmia and had an immediate and complete recovery after the seizure
  - Decision was made to continue with surgery, which proceeded without further complication

Limitations

- Retrospective
- Single surgeon
- Single facility
- Several different nurses in the PACU
- Three different anesthesiologists
- No clear protocol set prior to initiation of the trial for administration of narcotics, anti-emetics or criteria for discharge
- Pain scores were patient reported to nurses in the PACU, not to an unbiased observer.

Conclusions

- No significant benefit to Fascia Iliaca Block in concert with GA versus GA alone
  - Given the extra time, cost, potential risk, consideration should be given to abandoning this for hip arthroscopy
  - Femoral Nerve and Lateral Femoral Nerve blockade insufficient to provide meaningfully beneficial changes in post-op pain, nausea, time in PACU, morphine equivalent dosage
    - No blockade of Obturator, Nerve to Quadratus, Sciatic,

Conclusions

- Lumbar Plexus Block administered in conjunction with GA provides significant and clinically meaningful decrease in post-operative pain in PACU

- Risks of LPB and experience of anesthesiologist should be considered before offering this technique to patients

References

- Birnbaum K; Prescher A; Hessler S; Heller K. The Sensory Innervation of the Hip Joint - An Anatomical Study. *Surgical and Radiologic Anatomy*. 1997;19(6):371-5.
- Dold et al. Preoperative Femoral Nerve Block in Hip Arthroscopic Surgery: A Retrospective Review of 108 Consecutive Cases. *Amer J Sports Med* 2013;20(10).
- Monzon et al. Single Fascia Iliaca Compartment Block for Post-Hip Fracture Pain Relief. *J Emer Med* 207;32(3)257-262.
- Anaraki et al. The Effect of Fascia Iliaca Compartment Block Versus Gabapentin on Postoperative Pain and Morphine Consumption in Femoral Surgery, a Prospective, Randomized, Double-Blind Study. *Indian J Pain* 2014;28(2)111-116.
- Mouzopolous et al. Fascia Iliaca Block Prophylaxis for for hip fracture patients at risk for delirium: a randomized placebo-controlled study. *J Orthop Traumatol.*2009;10:127-133.
- Foss et al. Fasicai Iliaca Compartment Blockade for Acute Pain Control in Hip Fracture Patients: a arandomized placebo-controlled study. *Anesthesiology.*2007;106:773-778.
- Fascia Iliaca Block. *The New York School of Regional Anesthesia—NYSORA* 2013.
- Lumbar Plexus Block. *The New York School of Regional Anesthesia—NYSORA* 2013.
- Amiri HR, Zamani MM, Safari S. Lumbar plexus block for management of hip surgeries. *Anesth Pain Med*. Aug 2014
- Marino J, Russo J, Kenny M, Herenstein R, Livote E, Chelly JE. Continuous lumbar plexus block for postoperative pain control after total hip arthroplasty. A randomized controlled Trial. *J Bone Joint Surg Am*. 2009 January.
- Yadeau et al. Lumbar Plexus Blockade Reduces Pain After Hip Arthroscopy: A Prospective Randomized Controlled Trial. *Anesth Analg. 2012.*

Thank You