An Analysis Of The Efficacy Of PENG and PENG-LFCN Blocks For Total Hip Arthroplasty

Theresa Bowling, MD[1], Swaroopa Vaidya MS[1], Vlad Frenk MD[1], Robert Suriani MD[1], Juliet Jackson MD[1], David Maduram MD PhD[1]

[1]Department of Anesthesiology, St. Vincent's Medical Center, Bridgeport CT, USA; St. Vincent's Medical Center, Bridgeport CT, USA

Figures

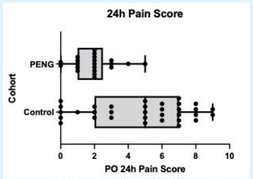


Figure 1: Univariate box-plot illustration of 24 hour pain scores measured amongst PENG cases and control cases.

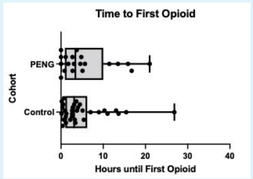
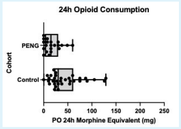
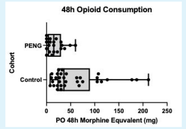


Figure 2: Univariate box-plot illustration of hours until first opioid measured amongst PENG cases and control cases.





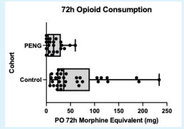


Figure 3-5: Univariate box-plot illustration of 24 hour, 48 hour, and 72 hour opioid consumption measured in oral morphine milliequivalents (mg) amongst PENG cases and control cases.

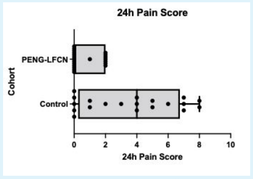


Figure 6: Univariate box-plot illustration of 24 hour pain score measured amongst PENG-LFCN cases and control cases.

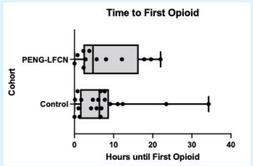
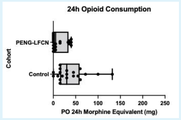
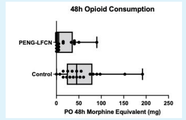


Figure 7: Univariate box-plot illustration of hours until first opioid measured amongst PENG-LFCN cases and control cases.





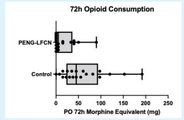


Figure 8-10: Univariate box-plot illustration of 24 hour, 48 hour, and 72 hour opioid consumption measured in oral morphine milliequivalents (mg) amongst PENG-LFCN cases and control cases.

Introduction

Total hip arthroplasty (THA) can be extremely painful, due to extensive dissection of soft tissues, muscles, ligaments, and bones, resulting in significant postoperative pain. Reduced postoperative pain can lead to enhanced patient satisfaction, earlier mobilization, and decreased time to discharge, resulting in reduced hospital costs. In addition, adequate postoperative pain management is often complicated by the fact that many of these patients suffer from preexisting chronic pain being treated with various analgesics, including opioids. Although it has been shown that postoperative multimodal analgesia is superior to a purely opioid-based regimen, there is still no consensus on the use of regional analgesia techniques after total hip arthroplasty. The pericapsular nerve group block (PENG) and combined PENG-LFCN (lateral femoral cutaneous nerve) block) is a recently described ultrasound-guided fascial plane block that was designed to aid with analgesia for hip fractures. The purpose of this study is to assess the analgesic efficacy of these two techniques.

Methods

In this study, we performed a retrospective, observational study of patients undergoing total hip arthroplasty at an urban, community hospital in Connecticut. This study was reviewed by Hartford Hospital Institutional Review Board. The PENG study involved two cohorts of patients, those receiving anterior-approach total hip arthroplasty with PENG blocks from June – September 2020 and those who underwent the same type of surgery without ESP blocks from January 2020 – May 2020. The PENG-LFCN study involved two cohorts of patients, those receiving posterior-approach total hip arthroplasty with PENG blocks from June – September 2020 and those who underwent the same type of surgery without ESP blocks from January 2020 – May 2020. Those with a preoperative BMI >50 and those using more than 20 morphine milligram equivalent (MME)/day preoperatively, as documented in the medical record, were excluded. Cumulative opioid requirements were tabulated in MME for the first 24, 48, and 72 hours after surgery.

Data Collection & Results

Records were identified through the hospital electronic health record (EHR) based on type of procedure, using an CPT code consistent with total hip arthroplasty. SPSS was used for statistical analysis. Continuous variables were compared between groups using the Mann-Whitney U test for variables with non-normal distributions and a two-tailed t-test for those that are normally distributed. Results yielding $p<0.05$ were deemed significant. Demographic Tables can be seen below:

Age	PENG Cases	Peng Controls	Peng-LFCN Cases	PENG-LFCN Copntrols
20 - 39	0 (0%)	0 (0%)	0 (0%)	0 (0%)
40 - 59	3 (14.3%)	9 (27.3%)	5 (23.8%)	5 (25%)
60 - 79	17 (81%)	21 (63.6%)	15 (71.4%)	12 (60%)
80+	1 (4.8%)	3 (9.1%)	1 (4.8%)	3 (15%)

Gender	PENG Cases	Peng Controls	Peng-LFCN Cases	PENG-LFCN Controls
Male	12 (57.1%)	18 (54.5%)	12 (57.1%)	12 (60%)
Female	9 (42.9%)	15 (45.5%)	9 (42.9%)	8 (40%)

PENG: 54 patients were included (33 controls, 21 PENG) with average LoS for controls = 1.7 (SD 0.59) vs. PENG = 1.3 days (SD 0.41; p=0.006). At 24 hours after surgery, the mean MME (SD) was 43.94 (33.68) and 17.07 (17.06) for controls vs. PENG, respectively (p=0.001). Significant differences in MME were observed at 48 hours with mean (SD) = 59.7 (54) for controls versus 17.3 (17.1) for PENG (p=0.001). The average pain score for controls was 4.76 (SD 2.93) vs. PENG = 1.95 (SD 1.2; p=0.001).

PENG-LFCN: 41 patients were included (20 controls, 21 PENG-LFCN) with average LoS for controls = 2.0 (SD 1.02) vs. PENG-LFCN = 1.3 days (SD 0.43; p=0.002). At 24 hours, the opioid consumption for controls was 38.2 (SD 34.1) MME vs.12.8 (SD 16.5) for PENG-LFCN (p=0.004). The average 48-hour opioid consumption for controls was 56.7 (SD 48.3) MME versus 16.1 (SD 24.1) for PENG-LFCN (p=0.001). The average 24-hour pain score for controls was 3.6 (SD 2.9) versus 0.71 (SD 0.96) for PENG-LFCN (p=0.0001).

Discussion

Although there is a robust body of literature recommending regional anesthesia for total hip arthroplasty, most patients rely on patient-controlled analgesia using opioids (IV-PCA) as a way of controlling pain after surgery. In this retrospective study, we found that both PENG and PENG-LFCN blocks were effective at reducing opioid consumption, regardless if using an anterior approach (PENG) or a posterior approach (PENG-LFCN). We found that these blocks were both logistically easy to implement in our workflow and easy to teach to novice trainees. It is important to note that this study has limitations, including lack of ability to control for our multimodal analgesia regimen, and possible restrictive inclusion criteria.

Conclusion

A statistically significant decrease in opioid requirement in the PENG and the PENG-LFCN block group, as compared to the historical control group, was noted up to 72 hours after both anterior and posterior-approach total hip arthroplasty. The data from this study supports these blocks as an effective method of post-operative pain management after hip surgery. Additional investigation will help to determine the role of these blocks in terms of other outcome measures (rehabilitation metrics, quality of recovery, and cost-benefit analysis analysis) as well as gauge its relative efficacy when using adjuncts such as liposomal bupivicaine admixtures.

References

Special thanks to Bill Lahiff for assistance with poster authorship and technical support.

1. Girón-Arango L, Peng PW, Chin KJ, et alPericapsular Nerve Group (PENG) Block for Hip FractureRegional Anesthesia & Pain Medicine 2018;43:859-863.
2. Sandri, Micol, Andrea Blasi, and Roberto Alberto De Blasi. "PENG block and LIA as a possible anesthesia technique for total hip arthroplasty." Journal of anesthesia 34.3 (2020): 472-475.
3. Thybo, K. H., et al. "Lateral femoral cutaneous nerve block after total hip arthroplasty: a randomised trial." Acta Anaesthesiologica Scandinavica 60.9 (2016): 1297-1305.