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Postoperative Analgesia for Hip Arthroplasty: Comparison of Continuous Lumbar Plexus Block and Epidural Analgesia

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ABSTRACT
As the population ages and hip osteoarthritis is common among the elderly, total hip arthroplasty (THA) is becoming a more common operation. Multiple related diseases and advanced age might provide an analgesic and anesthetic issue. To evaluate continuous lumbar plexus block (CLPB) and epidural analgesia (EA) for postoperative pain management in patients having hip replacements in terms of effectiveness, safety and patient satisfaction. The present study was a Comparative Study. This Study was conducted from One year. Total 162 patients were included in this study. Sample is made up of 162 patients with mean age of 67.22±11.57 years [32.,91]., 50.6% were males., 58.6% ASA II., 70.4% submitted to THA., 84.0% under SB. The epidural group has 77 patients with mean age of 65.44±4.95 years [37.,84]., 55.8% were females., 63.6% submitted to THA., 85.7% under SB. The cLPB group has 85 patients with mean age of 68.62±12.29 years [32.,91]., 56.5% were males., 72.9% submitted to THA., 82.4% under BGA. Groups are similar and do not have significant differences with regard to age (t test), gender, ASA and type of procedure (Chi-square test). We came to the conclusion that, following hip replacement surgery, postoperative pain control is essential. While both epidural analgesia (EA) and continuous lumbar plexus block (CLPB) are efficient methods, CLPB has certain unique benefits.

INTRODUCTION

As the population ages and hip osteoarthritis is common among the elderly, total hip arthroplasty (THA) is becoming a more common operation. Multiple related diseases and advanced age might provide an analgesic and anesthetic issue. During the first 24 hours after surgery, THA postoperative pain (POP), which ranges from mild to severe, gets worse with movement. Effective analgesia is essential to patients' recuperation in order to guarantee the comfort and contentment required for early mobility and functional rehabilitation. Therefore, proper THA analgesia reduces surgical morbidity and mortality and promotes recovery[1]. Several analgesic methods, including epidural analgesia, peripheral nerve block, lumbar plexus block and intravenous patient-controlled analgesia (PCA) with opioids, were investigated to relieve pain following THA. It is currently unknown which approach offers the best analgesic effectiveness, safety and postoperative recovery[2]. Therapeutic intravenous PCA regimens have a number of technical issues, secondary opioid effects and inadequate pain relief during movement. Although it has recognized side effects such hypotension, nausea, vomiting, pruritus, urine retention, motor block and respiratory depression, epidural blocks are the most frequent postoperative THA analgesia. Blocking peripheral nerves prevents the negative effects of local anesthetics and opioids given to the neuraxis by providing good analgesia with little motor and sympathetic blocks[3]. More attention has recently been paid to LPB as a THA analgesic method[1]. Skin irritation on the side of the thigh is caused by the lumbar plexus, which has branches that extend to the hip. Therefore, posterior LPB can induce efficient unilateral analgesia, reduce the need for additional analgesics and aid in the recovery and satisfaction of patients following total hip arthroplasty. The use of a continuous infusion catheter can extend the duration of single shot LPB analgesia, which is restricted to the first eight postoperative hours[3]. Since there aren't many clinical studies comparing the safety profile and analgesic efficacy of continuous lumbar plexus block (cLPB) versus epidural analgesia in patients undergoing total hip arthroplasty (THA), we thought it would be crucial to look into whether cLPB could take the place of epidural analgesia in order to reduce the risk of side effects and to expedite recovery, functional rehabilitation and hospital stays. To evaluate continuous lumbar plexus block (CLPB) and epidural analgesia (EA) for postoperative pain management in patients having hip replacements in terms of effectiveness, safety and patient satisfaction.

MATERIALS AND METHODS

Study Type and Design: This was Comparative Study.

Study Duration: One year.

Sample Size: 162.

Inclusion Criteria:

- **Age:** Patients aged 18-80 years.
- **Surgical Procedure:** Patients undergoing elective primary or revision hip arthroplasty.
- **ASA Classification:** American Society of Anesthesiologists (ASA) physical status I-III.
- **Consent:** Patients who provide written informed consent to participate in the study.
- **Ambulatory Status:** Patients who were ambulatory (with or without assistance) preoperatively.
- **Pain Management Eligibility:** Patients eligible for either continuous lumbar plexus block (CLPB) or epidural analgesia based on anesthesiologist evaluation.

Exclusion Criteria:

Contraindications to Regional Anesthesia:

- Allergy to local anesthetics (e.g., bupivacaine, ropivacaine).
- Infection at the injection site.
- Coagulopathy or use of anticoagulants that cannot be paused preoperatively.
- History of severe adverse reactions to regional anesthesia.

Neurological Disorders:

- Pre-existing peripheral neuropathy or other neurological conditions affecting sensory or motor function in the lower extremities.

Chronic Pain Conditions:

- Patients with chronic opioid use or dependency.
- Pre-existing chronic pain syndromes affecting assessment of analgesic efficacy.

Cardiovascular or Respiratory Instability:

- Severe hypotension, bardycardia, or any condition that increases risk with epidural or lumbar plexus block.

Pregnancy:

- Pregnant or breast-feeding women.

Inability to Participate:

- Cognitive impairments or language barriers that prevent reliable communication of pain scores.
- Refusal or inability to comply with postoperative follow-up. Statistical Analysis:

Statistical Analysis: For statistical analysis, data were initially entered into a Microsoft Excel spreadsheet and

then analyzed using SPSS (version 27.0., SPSS Inc., Chicago, IL, USA) and GraphPad Prism (version 5). Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests, which compare the means of independent or unpaired samples, were used to assess differences between groups. Paired t-tests, which account for the correlation between paired observations, offer greater power than unpaired tests. Chi-square tests (χ^2 tests) were employed to evaluate hypotheses where the sampling distribution of the test statistic follows a chi-squared distribution under the null hypothesis., Pearson's chi-squared test is often referred to simply as the chi-squared test. For comparisons of unpaired proportions, either the chi-square test or Fisher's exact test was used, depending on the context. To perform t-tests, the relevant formulae for test statistics, which either exactly follow or closely approximate a t-distribution under the null hypothesis, were applied, with specific degrees of freedom indicated for each test. P-values were determined from Student's t-distribution tables. A p-value ≤ 0.05 was considered statistically significant, leading to the rejection of the null hypothesis in favour of the alternative hypothesis.

RESULTS AND DISCUSSIONS

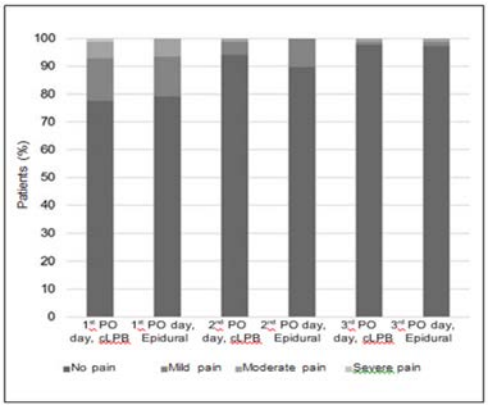

Fig. 1: Comparison of Pain Intensity at Rest Along the Three Days for Both Groups

During the study period, a universe of 165 patients was evaluated. Three patients were excluded for not establishing blockade or for insufficient analgesia (1 from the epidural group and 2 from the cLPB group). characterization of sample and of groups. Sample is made up of 162 patients with mean age of 67.22±11.57 years [32.,91]., 50.6% were males., 58.6% ASA II., 70.4% submitted to THA., 84.0% under SB. The epidural group has 77 patients with mean age of 65.44±4.95 years [37.,84]., 55.8% were females., 63.6% submitted to THA., 85.7% under SB. The cLPB group has 85 patients with mean age of 68.62±12.29 years [32.,91]., 56.5% were males., 72.9% submitted to THA., 82.4% under BGA. Groups are similar and do not have significant differences with regard to age (t test), gender, ASA and type of procedure (Chi-square test). The incidence of complications for both groups is shown in (table 2). cLPB group had a total number of complications significantly lower as compared to the epidural group (4.7% CLPB versus 23.4% epidural). However, the scarce incidence of each complication does not allow establishing statistically significant differences between groups. With regard to motor block degree, there has been blockade degree 1 in 1.2% of patients (n=1) with cLPB analgesia and in 3.9% of patients (n=3) with epidural analgesia. Pruritus was reported only by the epidural group, with incidence of 9.1% (n=7). The incidence of nausea and vomiting was higher in the epidural group (3.5% cLPB versus 10.4% epidural). There was one patient of each group in whom the catheter was exteriorized and in both cases APU discharge was determined for considering that patients no longer needed analgesic intervention. Most patients of both groups had no pain at rest during the first postoperative day (77.6% cLPB versus 79.2% epidural). Approximately 22.4% of patients (n=19) of the cLPB group had pain complaints, corresponding to mild pain in 15.3% of cases (n=13). These values are not significantly different from the epidural group, which had pain in 20.8% of cases (n=16), classified as mild pain by 14.3% of patients (n=11).

According to this study, cLPB offers analgesic efficacy comparable to epidural block, with the added benefit of presenting a superior safety profile. Additionally, the mean length of stay in the hospital was comparable for both methods. This demonstrates the actual clinical practice of the institution under study. The administration of varying ropivacaine doses for the cLPB group (0.2% ropivacaine) and the epidural group (0.1% ropivacaine), the association of fentanyl only in the epidural group and the random load dose given during the perioperative period for epidural analgesia are some of the limitations that come with a retrospective design. The low incidence of problems, which precludes the identification of statistically significant differences between groups, was another drawback of this study. In terms of the assessment of analgesic effectiveness, the incidence of total sensory block was greater in the cLPB group, but neither the severity of pain nor the frequency of rescue doses differed between the epidural and cLPB groups. In comparison to the group receiving epidural analgesia, which had 93.5% of patients in the similar circumstances, the cLPB group had 92.9% of patients with either no pain or light discomfort at rest on the first postoperative day. The majority of patients experienced no discomfort when moving on the first

Table 1: Distribution and Characterization of Evaluated Patients and Groups

Groups	Age	Gender	ASA	Surgery	Anesthetic technique						
		Male	Female	I	II	III	?	THA	THA Review	SB	BGA
Epidural (n=77)	65.44±4.95	34	43	5	43	14	15	55	22	66	11
cLPB (n=85)	68.62±12.29	48	37	3	52	17	13	59	26	70	15
Total (n=162)	67.22±11.57	82	80	8	95	31	28	114	48	136	26

Table 2: Comparison of Complications for Both Groups

Groups	Motor	Nausea and	Pruritus	Total block
cLPB (n=85)	1(1.2%)	3(3.5%)	0	4(4.7%)
Epidural (n=77)	3(3.9%)	8(10.4%)	7(9.1%)	18(23.4%)
Total (n=162)	4(2.5%)	11(6.8%)	7(4.3%)	22(13.6%)

postoperative day and the majority of the remaining patients reported very slight pain. The majority of rescue doses are given on the first postoperative day, emphasizing that a comparable proportion of patients in both groups (77.6% cLPB versus 77.9% epidural) have not required rescue analgesia. In the second and third postoperative days, POP at rest and during movement, as well as the requirement for rescue dosages, have significantly decreased in both groups. The epidural group has a lower incidence of full sensory block, with unilateral block for cLPB and bilateral block for epidural block. The findings further imply that the analgesic regimes used are suitable for the postoperative phase of hip replacement patients. Scarce literature data report that LPB provides excellent intra and post-operative analgesia, decreases opioid consumption, speeds recovery and has few adverse effects[4]. Türker[5] have compared LPB and epidural analgesia and have not found statistically significant differences in pain intensity and postoperative rescue analgesia consumption. Ilfeld[6] have concluded that most patients submitted to THA under analgesia with cLPB by Patient Controlled Regional Analgesia could walk 30 meters and be discharged in the first postoperative day. However, these results also differ from other studies. Duarte[7] have reported that patient controlled epidural analgesia with 0.2% ropivacaine and 3µg/mL fentanyl promotes more effective pain relief at rest and during mobilization as compared to cLPB with 0.2% ropivacaine and that both techniques are equivalent for functional rehabilitation. The incidence of rescue analgesia for the cLPB group was 23.5%, being much higher than 6.5% reported by Capdevilla[8]. Given that the protocol of this study employed perfusion with elastomer, which has intrinsic flow irregularities and that study used a mechanical infusion pump, this discrepancy is most likely the result of differing perfusion procedures. Few adverse effects were observed in our study, which is in line with other studies[4]. The cLPB group had lower incidence of complications as compared to the epidural group. The incidence of motor block and nausea and vomiting was lower in the cLPB group, although the difference was not statistically significant. The higher incidence of nausea and vomiting in the epidural group may be explained by the association of fentanyl in this group. No cLPB group patient has complained of pruritus, differently from 9.1% of patients with the epidural catheter who presented this complaint. Unfortunately, the low incidence of secondary effects and complications in the sample does not allow inferring the existence of significant differences between cLPB and epidural techniques. cLPB seldom has severe complications being known intoxication by local anesthetics following inadvertent intra vascular injections, spinal administration, intraperitoneal puncture, sub capsular renal hematoma by renal perforation and retro-peritoneal hematoma. With an incidence of 5%, drug dispersion to the epidural space was regarded by some writers as the most common LPB consequence. Bilateral local anesthetic epidural diffusion has not been affected by the blocking strategy chosen, which is likely the reason for high injection volumes and pressures, particularly those exceeding 20 psi. The safety offered by the dual guiding system, which combines electric stimulation and ultrasonography to check correct needle position, may be the reason why there were no serious problems in our trial[9]. Catheter position was verified in our study using X-rays with contrast injection, albeit this is not advised as standard practice in cases of limited analgesic effectiveness, blood traces in the catheter, or negative catheter aspiration. Although there may be misleading negative findings, aspiration before injection, negative test doses and fractionated and gradual medication delivery remain the best ways to avoid intra vascular injection. Because LPB is a very deep block, it should only be performed by qualified specialists and should not be performed on patients who have platelet dysfunction or changed coagulation tests. In our facility, cLPB was treated using the same anticoagulant guidelines as epidural catheter insertion and removal. There are no differences between cLPB and epidural groups with regard to hospitalization time. Most patients of both groups were discharged in the third postoperative day and almost all patients of the sample were discharged before the fourth postoperative day. Our results are different from studies suggesting that cLPB speeds postoperative recovery[10], suggesting that recovery times are similar for both groups. The hesitation of anesthesiologists to

use LPB may be explained by reports of serious consequences and their experience with other methods. Nevertheless, there are known secondary effects of epidural analgesia. Our research supports the findings of a few other studies that suggest cLPB may offer comparable or superior analgesia than epidural block, with the added benefit of lowering the likelihood of side effects. When general anesthesia is the preferred option, the Prospect Group suggests cLPB for postoperative THA analgesia. We anticipate that this study will help demystify post-operative pain management with cLPB and draw anesthesiologists' attention to the benefits of this method[11].

CONCLUSION

We came to the conclusion that, following hip replacement surgery, postoperative pain control is essential. While both epidural analgesia (EA) and continuous lumbar plexus block (CLPB) are efficient methods, CLPB has certain unique benefits. It offers comparable pain relief with fewer side effects, including hypotension, motor blockage and urine retention, allowing for quicker mobility and lowering the risk of thromboembolism. Despite being effective, EA has greater adverse effects and necessitates more hemodynamic monitoring, which limits its usage in some patients. For postoperative analgesia, CLPB is a more sensible and safe option. Future research should improve CLPB procedures and assess their long-term advantages for quality of life and rehabilitation.

REFERENCES

1. Ya Deau J.T., T. Tedore, E.A. Goytizolo, D.H. Kim, D.S. Green, A. Westrick, R. Fan, M.C. Rade, A.S. Ranawat, S.H. Coleman and B.T. Kelly., 2012. Lumbar plexus blockade reduces pain after hip arthroscopy: a prospective randomized controlled trial. Anesthesia and Analgesia., 115: 968-972.
2. Duarte L.T.D., F.C. Paes, M.D.B.C. Fernandes and R.Â. Saraiva., 2009. Posterior Lumbar Plexus Block in Postoperative Analgesia for Total Hip Arthroplasty. A Comparative Study between 0.5% Bupivacaine with Epinephrine and 0.5% Ropivacaine. Braz. J. Anesthesiol., 59: 273-285.
3. Touray S.T., M.A. de Leeuw, W.W.A. Zuurmond and R.S.G.M. Perez., 2008. Psoas compartment block for lower extremity surgery: A meta -analysis. Br. J. Anaesth., 101: 750-760.
4. Freitas H.F.A.V., F. Flores, L.C. Lima, T.C.D. Couceiro and M. Neves *et al.,* 2012. Avaliação da analgesia pós-operatória em artroplastias de quadril com morfina por via subaracnoidea associada ao bloqueio "3 em 1": Estudo aleatório e encoberto. Rev. Dor, 13: 137-140.
5. Türker G., N. Uçkunkaya, B. Yavasçaoglu, A. Yilmazlar and S. ÖZçelik., 2003. Comparison of the catheter-technique psoas compartment block and the epidural block for analgesia in partial hip replacement surgery. Acta Anaesthesiologica Scand., 47: 30-36.
6. Ilfeld B., P. Gearen, F. Enneking, L. Berry, E. Spadoni, S. George and K. Vandenborne., 2006. Total Hip Arthroplasty as an Overnight-Stay Procedure Using an Ambulatory Continuous Psoas Compartment Nerve Block: A Prospective Feasibility Study. Regional Anesthesia Pain Med., 31: 113-118.
7. Duarte L.T.D., P.S.S. Beraldo and R.Â. Saraiva., 2009. Effects of Epidural Analgesia and Continuous Lumbar Plexus Block on Functional Rehabilitation after Total Hip Arthroplasty. Braz. J. Anesthesiol., 59: 531-544.
8. Capdevila X., P. Macaire, C. Dadure, O. Choquet, P. Biboulet, Y. Ryckwaert and F. d'Athis., 2002. Continuous Psoas Compartment Block for Postoperative Analgesia After Total Hip Arthroplasty: New Landmarks, Technical Guidelines and Clinical Evaluation. Anesthesia and Analg., 94: 1606-1613.
9. Carvalho I., G. Costa, N. Lages and C. Correia., 2015. Cirurgia da anca e bloqueio do plexo lombar. Revista da Sociedade Portuguesa de Anestesiologia., 24: 6-11.
10. Biboulet P., *et al.,* 2004. Postoperative analgesia after total-hip arthroplasty: Comparison of intravenous patient-controlled analgesia with morphine and single injection of femoral nerve or PSO as compartment block. a prospective, randomized, double-blind study. Regional Anesthesia Pain Med., 29: 102-109.
11. e Costa G.M.P.D., I.M. Carvalho, A.I.R. Castro, N.C.R. Lages and C.M.M. Correia., 2016. Postoperative analgesia for hip arthroplasty: Comparison of continuous lumbar plexus block and epidural analgesia. Rev. Dor, 17: 2-7.