EFFICACY OF I-PACK BLOCK FOR ANALGESIA IN TOTAL KNEE ARTHROPLASTY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Abstract

Introduction. We performed a meta-analysis to determine if the addition of an iPACK to an adductor canal block (ACB) is effective at reducing pain scores and opioid consumption after total knee arthroplasty. ***Methods.*** Using the terms "total knee arthroplasty," "ipack," "adductor block" we systematically reveiwed PubMed, Embase, Scopus, the Cochrane Central Register of Controlled Trials and ClinicalTrials.gov for randomized controlled trials reporting the use of the iPACK block in adult total knee surgery published from 2017- 2020. The weighted mean difference (WMD) and 95% confidence interval (CI) was adopted to present continuous data. Heterogeneity amongst studies was assessed using Cochran's Q test (P < 0.10 was the standard indicating statistical significance) and the I2 index (I2 >50% was the standard indicating significant heterogeneity). The data with significant heterogeneity were analysed using a random-effects model for its wider CI when accounting for any potential variance between studies. Sensitivity analysis was implemented to assess the stability of the pooled results by deleting one trial at one time. ***Results.*** Relative to ACB alone, iPACK+ACB block significantly reduced 24 hour opioid consumption in oral morphine milliequivalent (MME) units (standard mean difference (95% CI) -0.38 [-0.64, -0.13]; p=.003). Relative to ACB alone, iPACK+ACB block reduced 24 hour pain with exercise (standard mean difference (95% CI) -0.07 [-0.39, 0.26]) although this result was not statistically significant (p = 0.68). ***Discussion.*** Data support the effectiveness of the iPACK+ACB block relative to ACB alone at reducing cumulative postoperative opioid consumption at 24 hours. ***Conclusion.*** Further evidence, preferably from properly blinded trials, is required to confirm these findings.

Introduction

Acute pain after a total knee arthroplasty can make it difficult for patients to participate in early postoperative rehabilitation, which can lead to poor recovery of knee joint function and decreased quality of life. The infiltration of local anesthetic into the interspace between the popliteal artery and capsule of knee (iPACK) is an established technique to address posterior knee joint pain. This systematic review and meta-analysis was undertaken to determine if the addition of an iPACK to an adductor canal block (ACB) is effective at reducing pain scores and opioid consumption after total knee arthroplasty.

Materials and Methods

Using the terms "total knee arthroplasty," "ipack," "adductor block" we searched PubMed, Embase, Scopus, the Cochrane Central Register of Controlled Trials and ClinicalTrials.gov for randomized controlled trials reporting the use of the iPACK block in adult total knee surgery published from 2017- 2020. We used the revised Cochrane risk-of-bias tool and the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) framework to assess risk of bias and trial quality. Statistical analyses were performed using Stata version 12.0 and RevManager 5.0. The weighted mean difference (WMD) and 95% confidence interval (CI) was adopted to present continuous data. Heterogeneity amongst studies was assessed using Cochran's Q test (P < 0.10 was the standard indicating statistical significance) and the I2 index (I2 >50% was the standard indicating significant heterogeneity). The data with significant heterogeneity were analysed using a random-effects model for its wider CI when accounting for any potential variance between studies. Sensitivity analysis was implemented to assess the stability of the pooled results by deleting one trial at one time. A P-value less than 0.05 was considered statistically significant. This study was exempt from IRB oversight.

Results

The literature review identified four randomized controlled trials representing 157 patients. Relative to ACB alone, iPACK+ACB block significantly reduced 24 hour opioid consumption in oral morphine milliequivalent (MME) units (standard mean difference (95% CI) -0.38 [-0.64, -0.13]; p=.003; Table 1). Relative to ACB alone, iPACK+ACB block reduced 24 hour pain with exercise (standard mean difference (95% CI) -0.07 [-0.39, 0.26]) although this result was not statistically significant (p = 0.68; Table 2).

Table 1. Comparison of ACB + iPACK vs. iPACK on 24 hour opioid consumption

Study or Subgroup	ACB+iPACK Mean	SD	Total	ACB Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI
Kertkiatkachorn 2020	6	8.88	34	0	0	35		Not estimable
LI 2020	32.4	26.31	50	48	23.46	50	40.4%	−0.62 [−1.02, −0.22]
Patterson 2020	90	50.38	35	79	48.1	34	29.1%	0.22 [−0.25, 0.69]
VanderWielen 2020	60.26	23.08	38	76.46	27.1	38	30.6%	−0.64 [−1.10, −0.18]
Total (95% CI)			157			157	100.0%	−0.38 [−0.64, −0.13]

Heterogeneity: $Chi^2 = 8.76$, $df = 2$ ($P = 0.01$); $I^2 = 77\%$
Test for overall effect: $Z = 2.93$ ($P = 0.003$)

Std. Mean Difference IV, Fixed, 95% CI
−2 −1 0 1 2
Favours ACB+iPACK Favours ACB

Table 2. Comparison of ACB + iPACK vs. iPACK on 24 hour pain with exercise

Study or Subgroup	ACB+iPACK Mean	SD	Total	ACB Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Kertkiatkachorn 2020	2.8	2.3324	34	2.2	1.7748	35	30.8%	0.29 [−0.19, 0.76]
LI 2020	4.78	1.02	50	4.96	0.78	50	38.7%	−0.20 [−0.59, 0.20]
Patterson 2020	5	4.4	34	6	2.96	34	30.5%	−0.26 [−0.74, 0.21]
Total (95% CI)			118			119	100.0%	−0.07 [−0.39, 0.26]

Heterogeneity: $Tau^2 = 0.03$; $Chi^2 = 3.20$, $df = 2$ ($P = 0.20$); $I^2 = 38\%$
Test for overall effect: $Z = 0.41$ ($P = 0.68$)

Std. Mean Difference IV, Random, 95% CI
−2 −1 0 1 2
Favours ACB+iPACK Favours ACB

Discussion

This review supports the effectiveness of the iPACK+ACB block relative to ACB alone at reducing cumulative postoperative opioid consumption at 24 hours. Although initial evidence showed that the addition of the iPACK block to ACB decreased pain at 24 hours with exercise, this effect was not statistically significant in this meta-analysis.

Conclusion

Further evidence, preferably from properly blinded trials, is required to confirm these findings.

References

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