The Effectiveness of Intrathecal Morphine Compared to Intravenous Methadone for Pain Control after Posterior Spinal Fusion in Adolescent Idiopathic Scoliosis

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INTRODUCTION

At our institution, patients with adolescent idiopathic scoliosis (AIS) undergoing posterior spinal fusion (PSF) receive an intrathecal (IT) injection of morphine prior to surgical positioning and a perioperative protocol of opioid and non-opioid analgesics. If the IT injection is technically challenging or contraindicated, IV methadone is given intraoperatively and in the immediate postoperative period (2 doses). Recent drug shortages have also affected our practice increasing the number of patients receiving methadone instead of IT morphine. We proceeded to compare the effect of these 2 analgesic modalities on perioperative and pain-related outcomes. We also examined the effect of the dose of IT morphine on these outcomes.

METHODS

The electronic medical record of patients with AIS who underwent PSF at our institution between March 2015 and July 2017 were retrospectively reviewed. 190 patients were identified.142 patients received IT morphine injection and 48 patients received IV methadone. Postoperative variables were collected and compared between the 2 groups: daily opioid use in morphine equivalent (MEQ), highest and average daily pain score, incidence of opioid-induced side effects as measured by the use of antiemetic and antipruritic medications, and use of diazepam.

RESULTS

Figure 1: Effect of IT Morphine vs IV Methadone on Pain Scores

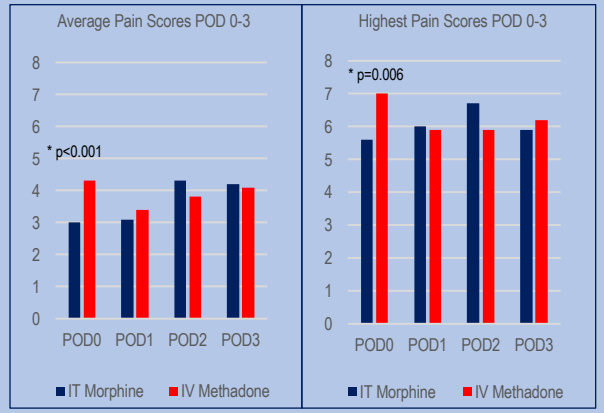

Table 1: Effect of IT Morphine vs IV Methadone on Rescue Medications

Cumulative Doses	IT Morphine		IV Methadone		p-value
	Mean	Median (min, max)	Mean	Median (min, max)	
Ondansetron	1.67	1 (0, 7)	1.75	1 (0, 8)	0.74
Phenergan	0.14	0 (0, 3.5)	0.02	0 (0, 1)	0.06
DPH	0.31	0 (0, 12.5)	0.48	0 (0, 5)	0.38
Nalbuphine	0.32	0 (0, 4)	0.13	0 (0, 6)	**0.028**
Diazepam	0.19	0.15 (0, 0.90)	0.21	0.18 (0, 0.59)	0.71

Table 2: Effect of IT Morphine Vs Methadone on Opioid Requirements

MEQ	IT Morphine		Methadone		p-value
	Mean ± SD	Median (min, max)	Mean ± SD	Median (min, max)	
POD1	33.9 ± 21.2	28.6 (4.8, 122.8)	38.2 ± 28.5	33.4 (0.0, 141.6)	0.27
POD2	33.3 ± 19.5	29.4 (2.5, 125.2)	30.9 ± 19.3	25.9 (5.0, 104.0)	0.47

Table 3: Effect of IT Morphine Dose on Rescue Medications

Doses	Coefficient	95% CI	p-value
Ondansetron POD0	0.008	-0.008 – 0.025	0.31
Ondansetron POD1	-0.011	-0.034 – 0.013	0.34
Ondansetron POD2	-0.01	-0.039 – 0.020	0.52
Cumulative ondansetron	-0.003	-0.016 – 0.010	0.69
Phenergan POD0	-0.018	-0.011 – 0.075	0.71
Phenergan POD1	0.017	-0.031 – 0.065	0.49
Phenergan POD2	0.01	-0.049 – 0.068	0.74
Cumulative phenergan	0.004	-0.030 – 0.039	0.80
DPH POD0	0.049	0.009 – 0.090	**0.016**
DPH POD1	-0.125	-0.297 – 0.048	0.16
DPH POD2	-0.221	-0.407	**0.033**
Cumulative DPH	-0.013	-0.067 – 0.040	0.63
Nalbuphine POD0	-0.184	-0.473 – 0.104	0.21
Nalbuphine POD1	-0.001	-0.030 – 0.030	0.99
Nalbuphine POD2	-0.063	-0.393 – 0.268	0.71
Cumulative nalbuphine	-0.008	-0.040 – 0.024	0.64
Diazepam POD0	-0.003	-0.106 – 0.100	0.96
Diazepam POD1	0.005	-0.046 – 0.054	0.86
Diazepam POD2	-0.009	-0.069 – 0.052	0.78
Cumulative diazepam	-0.002	-0.038 – 0.034	0.91

Table 4: Effect of IT Morphine Dose on Pain Scores

		r	r^2	p-value
Highest Pain Scores	POD0	-0.058	0.003	0.5
	POD1	0.012	0.001	0.89
	POD2	-0.049	0.002	0.56
	POD3	-0.072	0.005	0.41
Average Pain Scores	POD0	-0.091	0.008	0.29
	POD1	-0.059	0.003	0.49
	POD2	-0.096	0.009	0.26
	POD3	-0.101	0.01	0.24

Patients who received IT morphine experienced significantly less pain (highest and average pain scores) on the day of surgery (POD 0) compared to those who received IV methadone (Figure 1). There was no difference in pain scores between the 2 groups on postoperative days 1-3. The IT morphine group used more nalbuphine postoperatively compared to the IV methadone group (Table 1). There was no difference in daily opioid use in MEQ (Table 2), rescue doses of diazepam and ondansetron, or length of stay between groups. Within the IT morphine group, there was no relationship between the dose of IT morphine and postoperative pain scores. Higher doses of IT morphine were associated with increased diphenhydramine use on POD 0 and 2 (Table 3). There was no relationship between the dose of IT morphine and use of ondansetron, promethazine, or diazepam.

CONCLUSIONS

In patients undergoing PSF for AIS, IT morphine provided better analgesia immediately postoperatively compared to methadone, but increased the need for antipruritics. Lower doses of IT morphine achieved similar analgesia as higher doses and decreased antipruritic use. Besides the day of surgery, methadone yielded equivalent postoperative pain control as IT morphine, making it an acceptable analgesic approach for perioperative pain management for these patients.