



Research Article

The Impact of Patient Controlled Analgesia (PCA) in Laparoscopic Donor Nephrectomy

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Abstract

Background; Laparoscopic donor nephrectomy has largely replaced open donor nephrectomy in Australian centres. Adequate post-operative analgesia for these patients is a vital component of surgical recovery. Classically opiates have been the mainstay of analgesic therapy but their use is associated with potential dose related complications and may lengthen admission duration. We sought to assess post operative analgesia amongst patients undergoing laparoscopic donor nephrectomy at a major centre.

Methods: Retrospective cohort analysis spanning a 5 year period (2015-2020). Assessment of opiate delivery and dose requirement in form of patient controlled analgesia versus oral analgesia. Duration of stay, time to mobilisation and patient reported pain scores were collected.

Results: 137 patients were included. 118 (86%) were prescribed a PCA device post operatively. The most common PCA agent was oxycodone. Pain scores on day of operation and day 1 post operatively did not differ significantly between PCA patients (3.3, 2.3) and non PCA patients (n=30, 3.6, 2.6) (p=0.37, 0.21). Patients prescribed PCA analgesia had a longer duration of inpatient stay compared to those on oral agents only (3.28 vs. 2.7, p=0.003).

Conclusion The use of PCA devices post laparoscopic donor nephrectomy is common. They do not seem to offer improved analgesic benefit compared to oral only options. Patients prescribed a PCA had longer inpatient admission duration versus those on oral analgesia.

Background

Laparoscopic donor nephrectomy is associated with early recovery, decreased post-operative pain and decreased hospital stay in comparison to open surgery [1,2]. Living donors are a carefully selected group of patients that tend to be of relatively young age and have few comorbidities. Adequate post-operative analgesia is a vital component of patient recovery and rehabilitation. Current literature has reported that multi-modal analgesic approaches are of considerable benefit to patients [3]. Recent Enhanced Recovery After Surgery (ERAS) protocols have evaluated the use of opiate sparing analgesic regimes and found these to provide adequate analgesia to donor nephrectomy patients [3]. Furthermore the opiate sparing nature of ERAS protocols have demonstrated reduced hospital stays, lower morbidity and a faster return to function amongst a diverse range of patients in the United States [4,5].

The routine use of Patient-Controlled-Analgesia (PCA) devices has raised concern that these may defer patient recovery and in some instances, lead to delayed discharge due to complications of increased opiate doses such as nausea, constipation and sedation. Our study sought to evaluate and characterize the use of PCA devices amongst live kidney donors and assess their analgesic and non-analgesic affects in comparison to multimodal or oral options.

Methods

A single center retrospective cohort analysis was performed of all patients who underwent laparoscopic donor nephrectomy at an Australian tertiary hospital over a five-year period from 2015 – 2020 inclusive. Patient demographic and operative data was obtained from a prospectively collected database (HREC/2022/QMS/88521). All data was obtained via audit of electronic medical

records. Demographic data including age, gender and Body Mass Index (BMI) was collected. Operative data included nephrectomy side and primary operator. Data collected regarding pain management was via post-operative Pain-Rounds documentation (Acute Pain Service Review) and regularly recorded nursing observations. Day of operation (DOO) refers to period from operation through to pain rounds the following morning. Post-Operative Day One (POD1) is the 24 hours following DOO. Data collected included dosage of analgesic medications, self-reported pain levels and analgesia associated complications such as nausea and drowsiness. Other data collected included length of admission, opiate prescriptions provided at discharge, time to first assisted and unassisted mobilisation and time to bowel motion. Various opiate medications were used based on clinician preference. Standardization of doses was completed via conversion to oral morphine equivalent as per the Australia-New Zealand College of Anaesthetics guidelines [6]. Welch approximation t test was used to compare results between two groups.

Results

Between 2015 and 2020 a total of 137 patients underwent laparoscopic donor nephrectomy. Baseline characteristics of patients were similar amongst the PCA and non-PCA cohort (Table 1) (P values please as a column). All operations were completed laparoscopically with none requiring conversion to open nephrectomy. No patients were diagnosed with post-operative ileus and all were tolerating oral intake on the morning of post-operative day 1. PCA was prescribed for 86% of patients (n=118). Of these, 52 received fentanyl (44%), 65 received oxycodone (55%) and 1 received morphine (Table 2). The average inpatient stay was longer in the group prescribed PCA (3.28 days) compared to those prescribed oral analgesia only (2.74) days (p=0.003). The use of a PCA post operatively did not significantly impact patient reported pain scores (Table 3). Patients with a PCA reported average pain scores of 3.3+/- 1.36 and 2.3+/- 1.2 on day 1 and day 2 respectively. Patients without a PCA reported average DOO and POD1 pain scores of 3.6+/-1.34 and 2.6+/- 1.12 respectively which was not statistically significant (p=0.39 and 0.211 respectively).

	PCA (n=118)	Non-PCA (n=39)
Age, yr	52 (32-76)	51.6 (47-62) (p=0.80)
BMI	25.9 (17.5-35)	26.5 (20-32) (p=0.48)
Sex (% female)	52%	44%
Conversion to open rate %	0	0

Table 1: Demographic characteristics of patients undergoing laparoscopic donor nephrectomy. Age & BMI are average values. Range in parenthesis.

	Agent	Number (n=)	Total Day 1 dose – oral morphine equivalent
PCA	All agents	118	140.2mg
	Fentanyl	52	186.9mg
	Oxycodone	65	102.5mg
	Morphine	1	54mg
	All Agents	19	48.9mg
Oral Analgesia	Tapentadol + oxycodone	5	57mg
	Oxycodone/ naloxone + oxycodone	8	52.5mg
	Slow release oxycodone + oxycodone	1	75mg
	Oxycodone	6	30mg
	Total day 1 analgesic requirement OME – PCA vs. Oral Analgesia		

Table 2: Post-operative analgesia prescribing amongst donor nephrectomy patients.

	Average DOO patient reported pain score	Average POD1 patient reported pain score
PCA	3.3	2.3
Oral Analgesia	3.6	2.6
	p=0.379	p=0.211

Table 3: Average reported pain score of patients.

Early mobilisation with physiotherapy on POD1 was high amongst both groups. Of the PCA cohort 94% (n=111) were mobile with physiotherapy on POD1 compared with 89.5 % (n=17) of patients

on oral analgesia only. Mobilising independently however was slightly slower in the PCA group with 54 % (n=62) independently up on POD1 versus 74% (n=14) of the oral only cohort. The use of a PCA did not appear to impact the provision of discharge opiate prescriptions. Upon discharge the majority of patients were provided with analgesia prescriptions. 80% of PCA patients were provided with discharge opiate analgesia compared to 85% of non-PCA patients. Discharge analgesia information is described in Table 4. Complications associated with PCA use are routinely recorded as part of pain service rounds (Table 5). A total of 44% of patients prescribed a PCA reported some degree of adverse event related to PCA use. Excessive sedation or narcotisation leading to early revision or cessation of PCA occurred in 9 patients (7.6%). Nausea and vomiting was reported as bothersome in 36 patients (30%) with 20 of these requiring multiple anti-emetic agents. Seven patients (6%) reported dizziness.

Opiate agent	Number (n=137)
Oxycodone	59 (43%)
Oxycodone/Naloxone + Oxycodone	28 (20%)
No opiate prescription	25 (18%)
Tramadol	14 (10%)
Oxycodone/Naloxone	7 (5%)
Tapentadol	3 (2%)
Buprenorphine	1 (0.7%)

Table 4: Discharge Analgesia.

Complication of PCA	Incidence (n=118 patients)
Excessive sedation/narcotisation	7.6% (n=9)
Nausea and Vomiting	30.5% (n=36)
Dizziness	6% (n=7)

Table 5: Complications reported as consequence of PCA use.

Discussion

The majority of patients undergoing laparoscopic donor nephrectomy at our institution (86%, n=118) were routinely prescribed a PCA device post operatively. Although the prescribing of PCA was at the discretion of the anaesthetist, the use was fairly standardized and remained relatively unchanged. For example, in 2015, PCA use was in 89% of patients and use remained high in 2020 at 81% of patients. Pain scores reported

by patients were similar amongst the PCA and non-PCA cohort suggesting no significant analgesic benefit from the use of PCAs. Higher average OME doses were delivered amongst the PCA cohort (140.2mg vs. 48.9mg, p=0.001). This figure is interesting as the substantial increase in analgesia does not necessarily reflect a drastic improvement in the patient reported pain level. This is consistent with findings of similar cohort studies comparing post-operative analgesia options amongst nephrectomy patients(7). The average dose required amongst the fentanyl PCA cohort was markedly higher than the OME of other analgesic options and this likely reflects rapid onset with short acting effect resulting in more frequent dose requests.

The use of oral analgesia alone was associated with shorter hospital stay duration in comparison to those prescribed PCA's (3.28 days v 2.74 days, p0.003). In patients prescribed only oral analgesia – 95% (n=17) were discharged by post-operative day 3. In comparison amongst the PCA cohort 32% (n=38) remained inpatients beyond day 3. The reasons for this are complex and not fully explored within the limits of this study. Anecdotally the use of PCAs in this cohort may contribute to overall slower progress due to large opiate dose side effects such as constipation and nausea as well as generally slowed progress due to slowed mobility. Limited early mobility often acts as a barrier to removal of urinary catheter and generally slower progress with physiotherapy and progression towards discharge. Early mobilisation on day 1 post operatively was fairly uniform amongst the whole cohort however there was a trend toward earlier mobilisation independently amongst those using oral analgesia only. This may reflect a number of factors including ease of movement due to freedom from parenteral lines and potentially lower levels of sedation due to decreased opiate dosing. The majority of patients across the cohort were discharged with opiate prescriptions. The most common discharge prescription was short acting analgesia in the form of oxycodone alone (n=59, 43%). As patients were not followed up beyond discharge this study does not report on whether these prescriptions were filled nor the degree to which medications were used.

Conclusion

Effective post-operative pain management is a complex issue that typically requires a multimodal approach. PCA's are often prescribed to patients following donor nephrectomy however there is little evidence to suggest that they are the most appropriate option for these patients. Emerging evidence appears to favor a transition to an ERAS model of care that favors regional analgesia and timed non-opiate analgesic options. The routine use of PCAs amongst laparoscopic donor nephrectomy patients may contribute to longer hospital stays despite daily specialist review. Their use does result in an overall larger equivalent dose of opiate delivered but does not appear to offer significant analgesic effect based on patient reported pain levels. Decreased length of stay and decreased

opiate usage is likely to translate to improved patient satisfaction, a vital consideration given the nature of live donation surgery.

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