

Original Article

Postoperative Intravenous Ketorolac Significantly Reduces the Risk of Acute Urinary Retention Requiring Catheterization in Benign Anal Surgery

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Key Words

Anal surgery;
IV ketorolac;
Acute urinary retention;
Catheterization

Purpose. Urinary retention is a common complication after anal surgery, but it can be mainly prevented by fluid restriction and adequate pain control. Despite these strategies, nonsteroidal anti-inflammatory agents (NSAIDs) are more widely accepted because of the availability of parenteral ketorolac. The pain control effect of intravenous (IV) ketorolac has been widely described. However, its influence on postoperative catheterization has not been addressed.

Methods. A total of 116 patients who were subjected to benign anal surgery by a single surgeon (Ming-Cheng Chen.) were identified over a period of 1.5 years. Data on surgery type, anesthetic method, IV ketorolac (15 mg every 6 h), pain control agents, catheterization, time needed for surgery, elective or emergent surgery were collected.

Results. Of the total patients, 47 (40.52%) received regular IV ketorolac, 69 (59.48%) did not receive IV ketorolac. Of the 47 patients who received IV ketorolac, 3 (6.38%) required catheterization. This value was significantly lower than that in the non-IV ketorolac group, i.e., 16 of 69 (23.19%; $p = 0.032$). We found a significant overall association between IV ketorolac group and catheterization with an odds ratio of 0.174 (95% CI 0.035-0.871, $p = 0.033$). However, anesthesia type, surgery type, elective or emergent surgery had no significant associations.

Conclusions. Postoperative intravenous ketorolac may reduce the risk of acute urinary retention requiring catheterization in benign anal surgery. More data and a longer follow-up period are still needed to identify the possible complications, such as gastrointestinal bleeding or renal injury. [*J Soc Colon Rectal Surgeon (Taiwan) 2021;32:168-173*]

Benign anal surgery has a wide spectrum that includes operations for anal fissures, fistulas, hemorrhoids, pilonidal cysts, warts, and abscesses.¹ However, it causes urinary retention as a common complication. To prevent this complication effectively, sur-

geons provide perioperative fluid restriction and adequate pain relief.² Nevertheless, a multimodal pain control strategy has been widely used.³ For instance, non-narcotic pain medications are generally adequate for pain control in minor anal operations, such as

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fistulotomy or sphincterotomy. For other surgeries, opioids are most widely used at least for breakthrough pain.⁴ However, these agents may be associated with constipation, which likely exacerbates pain symptoms. Acetaminophen in conjunction with nonsteroidal anti-inflammatory agents (NSAIDs), such as ketorolac and ibuprofen, is an effective method to reduce the usage of narcotic agents.³ NSAIDs have become increasingly popular since the availability of parenteral ketorolac. However, they may cause adverse effects, such as gastrointestinal bleeding and renal and hepatic toxicity, especially in elderly patients.⁶ Although NSAIDs provide satisfactory pain control effects, many surgeons are reluctant to prescribe NSAIDs because of the risk of complications.

This study aimed to determine if IV ketorolac administered after benign anal surgery decreased the incidence of acute urinary retention requiring catheterization at our hospital.

Materials and Methods

Patients and method

A retrospective cohort study was performed between January 2020 and May 2021, when 116 patients were diagnosed with benign anal diseases and operated by a single surgeon (Dr. Ming-Cheng Chen) in Taichung Veterans General Hospital. The following benign anal diseases were observed in this study: hemorrhoids, anal fissures, anal fistulas, and peri-anal abscess. The following surgery types were applied: hemorrhoidectomy, and fistulotomy or fistulectomy. The patients were divided into two groups. In the NSAID group, regular IV ketorolac was prescribed (15 mg every 6 h) and the regimen bridged to oral pain control agents (NSAIDs, Ultracet, or both) on the following day. In the non-NSAID group, intravenous tramadol (50 mg) combined with oral pain control agents (NSAIDs, Ultracet, or both) was prescribed as needed. Data on the type of anesthesia, surgery type, operation time, pain control agents, catheterization, elective or emergent surgery and residual urine (if measured) were collected. Catheterization was de-

defined as either performing single-catheterization or placing an indwelling urinary catheter.

Statistical analysis

Clinical data were retrospectively collected from the hospital database. Continuous data were expressed as median (interquartile range [IQR]). Categorical data were presented as both number and percentage. Means were compared via a Mann-Whitney U test. Categorical variables were compared using Chi-square and Fisher's exact tests. Statistical analysis was performed using SPSS. Multinomial logistic regression was used to identify independent correlates that were associated with differences in catheterization.

Results

During the study period, 116 patients underwent benign anal surgery. Of these patients, 47 received regular IV ketorolac, and 69 did not receive IV ketorolac. The patients' baseline demographics are shown in Table 1, and the operative outcome is described in Table 2 and Table 3. Their catheterization rate significantly differed (23.19% vs. 6.38%, $p = 0.032$). We found a significant overall association between IV ketorolac group and catheterization with an odds ratio of 0.174 (95% CI 0.035-0.871, $p = 0.033$). However, anesthesia type, surgery type and elective or emergent surgery had no significant associations.

Discussion

NSAIDs are useful adjuncts to analgesic. They can help reduce the amount of opiates administered to patients, thereby minimizing the possible side effects of opioids.³ Their main mechanism involves the inhibition of cyclooxygenase (COX), causing an anti-inflammatory response by reducing prostaglandin production. NSAIDs are further classified on the basis of their selectivity of COX isoenzymes. COX-1 inhibitors are preferred to selective COX-2 inhibitors because they pose cardiovascular risks associated with

Table 1. Baseline demographic of the keto and the non-keto group

| | No regular keto (n = 69) | | Keto 0.5 ample q6h (n = 47) | | p value |
|-------------------|--------------------------|-----------|-----------------------------|---------|----------------------------|
| | Number | % | Number | % | |
| Catheterization | | | | | 0.032^{a,b} |
| Not catheterized | 53 | 76.81 | 44 | 93.62 | |
| Catheterized | 16 | 23.19 | 3 | 6.38 | |
| Age | 52 | (39-60.5) | 43 | (37-52) | 0.090 ^a |
| Gender | | | | | 0.865 ^b |
| Male | 55 | 79.71 | 36 | 76.60 | |
| Female | 14 | 20.29 | 11 | 23.40 | |
| Type anesthesia | | | | | 0.332 ^b |
| SA | 51 | 73.91 | 30 | 63.83 | |
| GA | 16 | 23.19 | 16 | 34.04 | |
| IVG + LA | 2 | 2.90 | 1 | 2.13 | |
| OP time (min.) | 25 | (15-40) | 25 | (20-35) | 0.666 ^a |
| Oral pain control | | | | | 0.031^{a,b} |
| None | 1 | 1.45 | 3 | 6.38 | |
| NSAID | 24 | 34.78 | 26 | 55.32 | |
| Ultracet | 30 | 43.48 | 10 | 21.28 | |
| NSAID + Ultracet | 14 | 20.29 | 8 | 17.02 | |
| Hemorrhoidectomy | 11 | 15.94 | 17 | 36.17 | 0.023^{a,b} |
| Fistulotomy | 59 | 85.51 | 32 | 68.08 | 0.044^{a,b} |
| Emergent surgery | | | | | 0.003^{a,b} |
| Elective surgery | 38 | 55.07 | 39 | 82.98 | |
| Emergent surgery | 31 | 44.93 | 8 | 17.02 | |

^a Mann-Whitney U test. ^b Chi-Square test. * $p < 0.05$, ** $p < 0.01$.

Continuous data were expressed as median (IQR).

Categorical data were expressed in both number and percentage.

Note. SA = spinal anesthesia; GA = general anesthesia; IVG = intravenous general anesthesia; LA = local anesthesia.

Table 2. Catheterization

| | Not catheterized (n = 97) | | catheterized (n = 19) | | p value |
|--------------------|---------------------------|-----------|-----------------------|---------|----------------------------|
| | Number | % | Number | % | |
| IV ketorolac | | | | | 0.032^{a,b} |
| No regular keto | 53 | 54.64 | 16 | 84.21 | |
| Keto 0.5 ample q6h | 44 | 45.36 | 3 | 15.79 | |
| Age | 45 | (37-56) | 55 | (40-67) | 0.120 ^a |
| Gender | | | | | 0.761 ^b |
| Male | 75 | 77.32 | 16 | 84.21 | |
| Female | 22 | 22.68 | 3 | 15.79 | |
| Type anesthesia | | | | | 0.539 ^b |
| SA | 67 | 69.07 | 14 | 73.68 | |
| GA | 28 | 28.87 | 4 | 21.05 | |
| IVG + LA | 2 | 2.06 | 1 | 5.26 | |
| OP time (min.) | 25 | (15-37.5) | 35 | (20-45) | 0.076 ^a |
| Oral pain control | | | | | 0.262 ^b |
| None | 3 | 3.09 | 1 | 5.26 | |
| NSAID | 45 | 46.39 | 5 | 26.32 | |
| Ultracet | 30 | 30.93 | 10 | 52.63 | |
| NSAID + Ultracet | 19 | 19.59 | 3 | 15.79 | |
| Hemorrhoidectomy | 21 | 21.65 | 7 | 36.84 | 0.238 ^b |
| Fistulotomy | 78 | 80.41 | 13 | 68.42 | 0.240 ^b |
| Emergent surgery | | | | | 0.555 ^b |
| Elective surgery | 66 | 68.04 | 11 | 57.89 | |
| Emergent surgery | 31 | 31.96 | 8 | 42.11 | |

^a Mann-Whitney U test. ^b Chi-Square test. * $p < 0.05$, ** $p < 0.01$.

Continuous data were expressed as median (IQR).

Categorical data were expressed in both number and percentage.

Note. SA = spinal anesthesia; GA = general anesthesia; IVG = intravenous general anesthesia; LA = local anesthesia.

Table 3. The risk of catheterization (multinomial regression model)

| Variables | Multinomial regression | | |
|--------------------|------------------------|-----------------|---------------|
| | Adjusted OR | 95% CI | p-value |
| IV ketorolac | 0.174 | (0.035-0.871) | 0.033* |
| Age | 1.014 | (0.974-1.057) | 0.488 |
| Gender (male) | 0.594 | (0.118-2.989) | 0.890 |
| Type of anesthesia | | | 0.346 |
| OP time | 1.050 | (1.003-1.099) | 0.037* |
| Oral pain control | | | 0.624 |
| Type of operation | | | |
| Hemorrhoidectomy | 1.815 | (0.06-58.846) | 0.732 |
| Fistulotomy | 5.184 | (0.178-150.728) | 0.338 |
| Emergent surgery | 1.800 | (0.399-8.125) | 0.444 |

* $p < 0.05$, ** $p < 0.01$.

95% CI were expressed as lower bound to upper bound.

COX-2 agents.⁷ COX-1 is predominantly affected by ketorolac, an injectable NSAID. Ketorolac reduces narcotic consumption by 25%-45% and functions as a common adjunct in the postoperative protocols of colorectal surgery.^{8,9} The use of NSAIDs is supported by the enhanced recovery after surgery (ERAS) protocols to minimize the use of opioids. However, the wound healing effect is impaired, possibly causing a higher risk of anastomotic leakage, which is a major concern. A meta-analysis¹⁰ in 2018 indicated that the use of NSAIDs after colorectal surgery may be associated with a higher risk of anastomotic leakage. Another systematic review¹¹ in 2020 reported opposite results. The PRECISION¹² and CONCERN¹³ trial provided suggestions on the choices of COX-1/COX-2 inhibitors. However, several issues on the long-term safety of NSAIDs remain unresolved. In principle, the lowest effective dose should be used for the shortest duration depending on the treatment goals of each patient,¹⁴ but no definite dose or duration has been established.

This procedure was performed by a single surgeon in a single institute, so the possible bias caused by the surgeon's preference was minimized. This study was mainly limited by its small sample size and short observation periods.

Our patients who received postoperative regular IV ketorolac were not given a dosage of more than 60

mg, i.e., most of them were given three doses of injection. The treatment was shifted to oral NSAIDs on the following day of the surgery. None of the patients had specific complaints about GI symptoms during hospitalization. Almost all the patients were discharged on the following day postoperation, the possible side effects could not be identified. In clinical practice, prescribing NSAIDs is avoided to patients older than 65 years and those who may be prone to renal injury (eGFR ranging from 60 ml/min/1.73 m² to 89 ml/min/1.73 m²). More data are required to establish specific criteria and achieve balance between the benefits of enhanced post-operative recovery and potential adverse effects of NSAIDs.

Besides, we found an association between operation time and catheterization with an adjusted odds ratio of 1.05 (95% CI 1.003-1.099, $p = 0.037$). Care should be taken for those who underwent long procedures. A protocol that optimizes perioperative fluid restriction and adequate pain control might be practical.

Conclusion

The cautious usage of postoperative intravenous ketorolac may reduce the risk of acute urinary retention requiring catheterization after benign anal surgery. However, this treatment should be cautiously administered to the elderly, especially those with poor renal or liver functions and history of peptic ulcer disease. More data and a longer follow-up period are needed to identify possible complications, such as gastrointestinal bleeding or renal injury.

Conflict of Interest Statement

The authors declare no conflict of interest in the study.

Role of the Funding Source

The authors declare no role of funding source in the study.

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原 著

對於肛門良性疾病手術，術後施打經靜脈克多炎 (Ketorolac) 能顯著降低急性尿滯留需放置導尿管的風險

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目的 急性尿滯留為肛門手術常見之併發症，且限水與疼痛控制能有效降低此風險。非類固醇消炎藥 (NSAIDs) 之中，可由靜脈給予的克多炎 (Ketorolac) 逐漸被廣泛的使用。有不少文章討論靜脈給予之非類固醇消炎藥用於肛門手術止痛的效果，但鮮少研究提及其與置放尿管的關聯性。

方法 我們蒐集了台中榮民總醫院過去一年半中，由單一外科醫師 (陳明正) 執行之良性肛門疾病手術病人共 116 位。資料來源根據病歷記載，蒐集了關於手術種類，麻醉方式，是否使用靜脈克多炎 (每 6 小時 15 毫克)，術後口服止痛藥物種類，置放尿管，手術時間，常規手術或急診手術。

結果 總共 47 位病人 (40.52%) 接受術後靜脈克多炎，69 位病人 (59.48%) 沒有施打。在有施打克多炎的病人中，只有 3 位需要置放導尿管 (6.38%)，統計上顯著比沒施打組的少 (23.19%, $p = 0.032$)，調整後的勝算比為 0.174 (95% 信賴區間 0.035-0.871, $p = 0.033$)。而手術種類，麻醉方式，常規手術或急診手術則沒有統計上的差異。

結論 肛門良性疾病術後常規給予經靜脈克多炎，能降低急性尿滯留需置放導尿管之風險。在未來，我們需要更多的病人資料以及更長的追蹤時間來評估這些可能的副作用。

關鍵詞 肛門手術、經靜脈克多炎、急性尿滯留、尿管置放。