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ORIGINAL RESEARCH

Reduced pain intensity at the first dressing improves postoperative pain control after anorectal surgery

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Abstract

This study aimed to investigate the effects of first dressing changes on the postoperative pain intensity and the duration of pain in patients after anorectal surgeries to provide evidence for improving postoperative pain control. A total of 164 patients with an anorectal disease scheduled to undergo surgery were enrolled in this study, and their postoperative pain levels and duration were recorded. The status of severe pain for a rating score $\geq$7 during hospitalization after surgery was considered as the study endpoint. The pain score at the first dressing change was recorded and considered a potential risk factor for predicting severe pain during hospitalization by logistic regression analysis. Comparisons of postoperative pain outcomes between patients with a pain rating score $\geq$7 or $<$7 were performed before and after propensity score matching. Severe pain (rating score $\geq$7) at the first dressing change was an independent risk factor for severe pain during hospitalization (odds ratio (OR) = 8.33, $p < 0.001$). Pain on the first night after surgery in the Severe group was higher than in the Non-Severe group (3.2 $\pm$ 0.9 *vs.* 2.8 $\pm$ 1.0, $p = 0.006$). Patients in the Severe group had higher pain number rating scale (NRS) scores at the second (5.2 $\pm$ 1.3 *vs.* 3.1 $\pm$ 1.2, $p < 0.001$) and third (3.5 $\pm$ 1.5 *vs.* 1.9 $\pm$ 0.9, $p < 0.001$) dressing change than those in the Non-Severe group. Moreover, the overall NRS pain score during hospitalization in the Severe group was significantly higher than the Non-Severe group (5.7 $\pm$ 1.1 *vs.* 3.9 $\pm$ 1.5, $p < 0.001$), and the incidence of severe postoperative pain during hospitalization was also higher (61.6% *vs.* 12.1%, $p < 0.001$). In addition, pain duration in the Severe group was significantly longer than in the Non-Severe group (10 (3, 18) *vs.* 5 (2, 10), $p < 0.001$). Regarding the distributions of propensity scores, the overall NRS pain score during hospitalization in the Severe group was significantly higher than in the Non-Severe group (5.7 $\pm$ 1.1 *vs.* 3.8 $\pm$ 1.4, $p < 0.001$), as well as a higher incidence in severe postoperative pain (61.2% *vs.* 7.5%, $p < 0.001$), which was accompanied by a significantly longer pain duration in the Severe group (10 (3, 18) *vs.* 5 (2, 10), $p < 0.001$). Moreover, subgroup analysis showed that patients in the Severe group had higher overall pain NRS scores than the Non-Severe group for both the Milligan-Morgan (5.6 $\pm$ 1.5 *vs.* 4.0 $\pm$ 1.1, $p < 0.001$) and Thread-ligating (5.8 $\pm$ 1.4 *vs.* 3.9 $\pm$ 1.0, $p < 0.001$) surgery groups. Pain intensity at the first dressing change was sociated with the intensity and duration of postoperative pain in patients who underwent anorectal surgery. Thus, proper actions are needed to relieve the pain intensity at the first dressing change.

Keywords

Anorectal diseases; Postoperative pain; First dressing change; Degree of pain

1. Introduction

Anorectal disorders are commonly encountered in routine practice and are an important cause of increased morbidity worldwide. According to a survey regarding anorectal diseases in China, its total incidence in the population aged 16–60 may reach as high as 59.1% [1]. Radical surgery is the most frequently recommended treatment for anorectal diseases, with postoperative pain being one of its most common complications [2]. Studies have shown that nearly 65% of patients experience moderate to severe pain in the early postoperative period, which delays the patients' rehabilitation [3]. Severe postoperative pain was demonstrated to affect patients' rest, sleep, wound healing, hospitalization duration, and so on, thereby affecting the patients' rehabilitation and recovery [4, 5]. Thus, it is urgent to implement postoperative pain relief strategies to alleviate the pain intensity and shorten its duration.

Tissue and nerve damage induced by surgical procedures is the primary and potentially inevitable source of pain for patients undergoing anorectal surgery. Additionally, one of the most important interventions inducing more pain post-surgery is wound dressing change [6]. Numerous studies have shown that pain is a significant risk factor for severe postoperative pain [7, 8]. Thus, we hypothesized that the pain intensity at the first wound dressing change would influence postoperative pain experience. This study aimed to elucidate the effects of the first dressing change on postoperative pain intensity and duration after anorectal surgery.

2. Patients and methods

2.1 Patient information

This study was a single-center, retrospective observational study designed according to the strengthening the Reporting of OBservational studies in Epidemiology (STROBE) guidelines. The data in the study can be obtained from the corresponding author upon reasonable request.

A total of 223 patients with mixed hemorrhoid or anal fistula were screened at the Department of Proctology, Shangjin district, West China Hospital of Sichuan University, from July 2019 to October 2021. The exclusion criteria included secondary surgery, American Society of Anesthesiologists Physical Status Classification (ASA class) IV or V, mental disease or chronic pain, and taking analgesics within three months. Finally, 164 patients were identified as eligible for this study.

2.2 Treatment procedures

In the hospital, after specialized examinations, all diagnoses of the patients were in line with the diagnostic criteria of mixed hemorrhoids and anal fistulas from the guidelines for the diagnosis and treatment of common diseases. The patients underwent surgery under general anesthesia according to a conventional procedure. Milligan-Morgan and thread-ligating surgery were the most common surgery performed on these patients. A single dose of dezocine injection (20 mg) was given once daily for the first 3 days after surgery. Extra analgesic treatment using an indomethacin suppository was given when needed.

2.3 Outcomes

Postoperative pain was assessed using a numerical rating scale (NRS) in which numbers were used to assign the intensity of pain in a straight line ranging from 0–10, with 0 representing no pain, 1–3 representing mild pain, 4–6 representing moderate pain, and 7–10 representing severe pain. The primary outcome of the study was the overall pain intensity during hospitalization, which was routinely evaluated and recorded by a nurse. Patients' pain intensity was also assessed on the first night after the surgery. The time for changing the wound dressing was unified from 8 to 9 AM. The dressing change process included local disinfection, cleaning, removing the wound dressing, disinfection again, and covering the wound with a dressing. Then, the pain intensity at the first dressing change (one-day post-surgery), second dressing change (two days post-surgery) and third dressing change (three days post-surgery) were evaluated, and the pain intensity at the first dressing change was taken as the primary effect factor. According to whether the NRS score at the first dressing change was $\geq$7, The patients were grouped into a Severe or Non-Severe group if their NRS score at the first dressing change was $\geq$7 or $<$7, respectively.

In addition, the duration of pain sensation in patients after dressing change was recorded through telephone follow-up in a single-blinded procedure. All the subjects' basic information, including age, sex, height, weight and surgical mode, was recorded.

2.4 Power calculation

In the current study, the overall pain intensity during hospitalization was considered the primary endpoint, and propensity sore-matched (PSM) analysis was performed as the primary analysis. The power according to a two-sided Non-Severe group comparison was calculated using the PASS software version 11.0 (NCSS, Hayesville, UT, USA), and a sample size of 67 in the PSM analysis achieved a 0.999 power to detect a rate difference of 1.9 in NRS pain score during hospitalization between the Severe and Non-Severe group.

2.5 Statistical analysis

The experimental data were analyzed using the Statistical Package for the Social Sciences (SPSS) v24.0 statistical software (IBM Corp., Armonk, NY, USA). The measurement data are expressed as mean $\pm$ standard deviation (SD) and enumeration data as the number of cases and percentages (%). A logistic regression analysis was performed to identify the potential factors associated with severe pain during hospitalization after surgery. The baseline variables, including sex, age group ($<$45 or $\geq$45), BMI group ($\leq$18.5 kg/m^2, 18.5–25 kg/m^2, $\geq$25 kg/m^2), surgery types (Milligan-Morgan and thread-ligating) and severe pain, at the first, second and third dressing change (yes/no), were included in the model.

Independent *t*-tests or chi-square tests were performed to compare the difference between the Severe and Non-Severe groups. We also performed PSM analysis to compare the difference between the Severe and Non-Severe groups using the 1:1 nearest neighbor method without replacement under a logistic regression analysis model. $p < 0.05$ was considered statistically significant.

3. Results

3.1 Demographics and clinical data

A total of 164 patients, including 102 males and 62 females aged 18 to 70 years (mean age, 39.8 $\pm$ 11.2 years), were enrolled in this observational study. The demographic characteristics of the patients before and after surgery are shown in Table 1. The results showed that the patients' reported pain NRS score on the first night after the surgery was 3.02 $\pm$ 0.96, and there was no patient with severe pain. The mean pain NRS score for the first dressing change was 5.3

TABLE 1. Demographic and clinical data for all patients.

Factors	Numerical value (n = 164)
Year	39.8 ± 11.2
Age group (≥45, %)	55 (33.5%)
Height (cm)	161.5 ± 8.7
Weight (kg)	62.4 ± 9.9
BMI (kg/cm2)	23.9 ± 3.3
Sex (male, %)	102 (62.2%)
Surgery type (%)	
Milligan-Morgan	98 (59.8%)
Thread-ligating	66 (40.2%)
Pain NRS on the first night after the surgery	3.02 ± 0.96
Pain NRS at the first dressing change	5.3 ± 1.9
NRS ≥7 at the first dressing change (%)	73 (44.5%)
Pain NRS at the second dressing change	4.0 ± 1.6
NRS ≥7 at the second dressing change (%)	27 (16.5%)
Pain NRS at the third dressing change	2.6 ± 1.4
NRS ≥7 at the third dressing change (%)	9 (5.5%)
Overall pain NRS during hospitalization	4.7 ± 1.5
NRS ≥7 during hospitalization (%)	56 (34.1%)
Pain duration (day)	5 (2, 14)
Hospital stay (day)	8.7 ± 2.7

BMI = body mass index; NRS = number rating scale.

TABLE 2. Logistic regression of different factors on overall severe postoperative pain during hospitalization.

Factors	Wald x^2	*p* value	OR	95% CI
Age group (Ref. ≥45)	1.675	0.196	1.78	0.74–4.26
Sex (Ref. male)	0.662	0.662	1.22	0.50–2.95
BMI group (Ref. 18.5–25)	0.649	0.723		
≤18.5	0.550	0.458	2.64	0.20–34.5
≥25	0.173	0.677	1.20	0.50–2.87
Surgery category (Ref. thread-ligating therapy)	0.309	0.578	1.28	0.53–3.08
Severe pain at the first dressing change (Ref. no)	23.472	<0.001	8.33	3.57–20.00
Severe pain at the second dressing change (Ref. no)	4.537	0.033	4.00	1.12–14.28
Severe pain at the third dressing change (Ref. no)	0.597	0.440	2.63	0.22–50.00

BMI: body mass index; CI: confidence interval; OR: odds rate; Ref.: reference.

± 1.9, and 44.5% of patients experienced severe pain during the first dressing change. The overall pain NRS score during patient hospitalization was 4.7 ± 1.5, and 34.1% of patients experienced severe pain. The duration of pain was 5 (2–14) days, and the average length of hospital stay was 8.7 ± 2.7 days.

3.2 Logistic regression of overall severe postoperative pain during hospitalization

As shown in Table 2, the results of logistic regression indicated that severe pain (NRS ≥7) at the first dressing change was one of the most significant independent risk factors for severe pain post-surgery, with an OR of 8.33 (95% confidence interval (CI): 3.57–20.00, $p < 0.001$). In addition, severe pain at the second dressing change was a significant independent risk for the overall severe pain during hospitalization, with an OR of 4.00 (95% CI: 1.12–14.28, $p = 0.033$).

3.3 Comparisons of patients with NRS ≥7 or <7 at the first dressing change

Here, we grouped the patients according to whether they experienced severe pain at the first dressing change. Comparison items between the Severe and Non-Severe groups are shown in Table 3. The results showed no significant difference in demographic and basic characteristics between the two groups. However, pain on the first night post-surgery in the Severe group was higher than in the Non-Severe group (3.2 ± 0.9 *vs.* 2.8 ± 1.0, $p = 0.006$). Patients in the Severe group had higher pain NRS scores at the second (5.2 ± 1.3 *vs.* 3.1 ± 1.2, $p < 0.001$) and third (3.5 ± 1.5 *vs.* 1.9 ± 0.9, $p < 0.001$) dressing changes compared with the Non-Severe group. Moreover, during hospitalization, the Severe group had significantly higher overall pain NRS score (5.7 ± 1.1 *vs.* 3.9 ± 1.5, $p < 0.001$) and incidence of severe postoperative pain (61.6% *vs.* 12.1%, $p < 0.001$) than the Non-Severe group. In addition, the pain duration in the Severe group was significantly longer than in the Non-Severe group (10 (3, 18) *vs.* 5 (2, 10), $p < 0.001$). However, there was no significant difference in hospitalization stay between the two groups.

3.4 Propensity score matching of the Severe and Non-Severe groups

After propensity score matching, 67 pairs of patients in the Severe and Non-Severe groups were included. The demographic characteristics between the two groups, including pain NRS scores on the first night post-surgery, were well-balanced (Table 4). Comparison between the two groups showed that the overall pain NRS score during hospitalization in the Severe group was significantly higher (5.7 ± 1.1 *vs.* 3.8 ± 1.4, $p < 0.001$) as well as the incidence of severe postoperative pain (61.2% *vs.* 7.5%, $p < 0.001$) compared with the Non-Severe group. We also observed that the Severe group had a significantly longer pain duration than the Non-Severe group (10 (3, 18) *vs.* 5 (2, 10), $p < 0.001$).

3.5 NRS pain score between the Severe group and the Non-Severe group

As shown in Fig. 1, subgroup analysis showed that patients in the Severe group had higher overall NRS pain scores than the Non-Severe group for both the Milligan-Morgan (Fig. 1A, 5.6 ± 1.5 *vs.* 4.0 ± 1.1, $p < 0.001$) and Thread-ligating (Fig. 1B, 5.8 ± 1.4 *vs.* 3.9 ± 1.0, $p < 0.001$) surgery groups.

4. Discussion

Hemorrhoids and anal fistulas are common diseases with high clinical incidence, which can be attributed to either internal or external factors [9]. Internal pathogenesis mainly includes physiological, anatomical and genetic factors, while external pathogenesis mainly comprises improper diet, sedentary lifestyle, and lack of exercise [10]. Presently, radical surgery is the main therapeutic option for treating hemorrhoids and anal fistulas. Additionally, dressing changes are routine postoperative procedures for anorectal patients and play an important role in disease recovery. Pain during postoperative dressing change is a major concern in patients suffering from anorectal diseases due to many factors, which could be due to anatomic features, physiological functions, surgical injuries, postoperative wound infections, postoperative wound scar tissue contraction and compression, anal skin injury, and anal narrowing after healing [11, 12]. During wound dressing changes, patients can experience various degrees of pain, which can lead to anxiety, irritability, pain and other negative emotions that could in turn mitigate their recovery [13]. Meanwhile, some patients are hypersensitive to pain-induced strong reactions, such as hypertension, tachycardia, nausea, sweating and even cardiac arrest [13]. In addition, postoperative pain could compromise patients' immune function, prolong postoperative recovery and seriously impair the quality of recovery in patients with anorectal diseases [14, 15].

The key to postoperative pain control lies in early pain relief techniques, relaxation of anal sphincter spasms, elimination of wound inflammation, remission of edema and congestion, and blocking the vicious cycle of "pain-sphincter spasm-pain aggravation" [16]. In clinics, analgesics are regarded as important components of therapy as they relieve pain but may sometimes lead to unfavorable adverse reactions that further exacerbate pain [17]. For instance, Dizocine, one of the most extensively used postoperative analgesics in China, was shown to cause adverse events such as nausea, vomiting, dizziness, drowsiness, heart palpitations, chest tightness, itching, urinary retention and sweating [18, 19].

This study retrospectively recruited 164 patients with mixed hemorrhoids and anal fistulas who underwent anorectal surgery to investigate whether there was a statistically significant difference in pain levels after the first dressing change. The results showed that patients who experienced severe pain at the first dressing change had higher pain scores in the next two dressing changes and throughout their hospitalization stay, and their pain duration was significantly longer than patients without severe pain. Postoperative patients with a primary treatment pain score <7 (six being the threshold of severe pain) had a shorter pain duration than

TABLE 3. Comparisons of demographic, preoperative and intraoperative data between patients with NRS ≥7 or <7 at the first dressing change.

	Severe group (n = 73)	Non-Severe group (n = 91)	*p* value
Age (year)	39.7 ± 11.2	39.8 ± 10.6	0.931
Age group (≥45, %)	25 (34.2%)	30 (33.3%)	0.863
Height (cm)	161.3 ± 9.4	161.7 ± 8.08	0.798
Weight (kg)	62.5 ± 9.1	62.3 ± 10.5	0.899
BMI (kg/cm^2)	24.1 ± 3.2	23.8 ± 3.4	0.642
Sex (male, %)	45 (61.6%)	56 (61.5%)	0.988
Surgery type (Thread-ligating %)	27 (37.0%)	39 (42.9%)	0.446
Pain NRS on the first night after the surgery	3.2 ± 0.9	2.8 ± 1.0	0.006
Pain NRS at the second dressing change	5.2 ± 1.3	3.1 ± 1.2	<0.001
NRS ≥7 at the second dressing change (%)	25 (34.2%)	2 (2.2%)	<0.001
Pain NRS at the third dressing change	3.5 ± 1.5	1.9 ± 0.9	<0.001
NRS ≥7 at the third dressing change (%)	8 (11.0%)	1 (1.1%)	0.006
Overall pain NRS during hospitalization	5.7 ± 1.1	3.9 ± 1.5	<0.001
NRS ≥7 during hospitalization (%)	45 (61.6%)	11 (12.1%)	<0.001
Pain duration (day)	10 (3, 18)	5 (2, 10)	0.010
Hospital stay (day)	8.5 ± 2.6	8.8 ± 2.8	0.508

BMI = body mass index; NRS = number rating scale.

TABLE 4. Comparisons of demographic, preoperative and intraoperative data between the patients with NRS ≥7 or NRS <7 at the first dressing change after propensity score matching.

Factors	Severe group (n = 67)	Non-Severe group (n = 67)	*p* value
Age (year)	40.1 ± 12.0	40.0 ± 10.0	0.938
Height (cm)	162.0 ± 9.4	161.8 ± 8.2	0.914
Weight (kg)	63.2 ± 9.1	64.0 ± 11.0	0.609
BMI (kg/cm^2)	24.1 ± 3.3	24.4 ± 3.5	0.545
Sex (male %)	43 (64.2%)	44 (65.7%)	>0.999
Surgery type (Thread-ligating %)	27 (40.3%)	25 (37.3%)	0.859
Pain NRS on the first night after the surgery	3.1 ± 0.9	3.0 ± 1.0	0.362
Pain NRS at the second dressing change	5.2 ± 1.3	3.1 ± 1.2	<0.001
NRS ≥7 at the second dressing change (%)	22 (32.8%)	2 (3.0%)	<0.001
Pain NRS at the third dressing change	3.5 ± 1.4	2.0 ± 0.9	<0.001
NRS ≥7 at the third dressing change (%)	7 (10.4%)	1(1.5%)	0.068
Overall pain NRS during hospitalization	5.7 ± 1.1	3.8 ± 1.4	<0.001
NRS ≥7 during hospitalization (%)	41 (61.2%)	5 (7.5%)	<0.001
Pain duration (day)	10 (3, 18)	5 (2, 10)	0.016
Hospital stay (day)	8.5 ± 2.6	8.9 ± 3.0	0.508

BMI = body mass index; NRS = number rating scale.

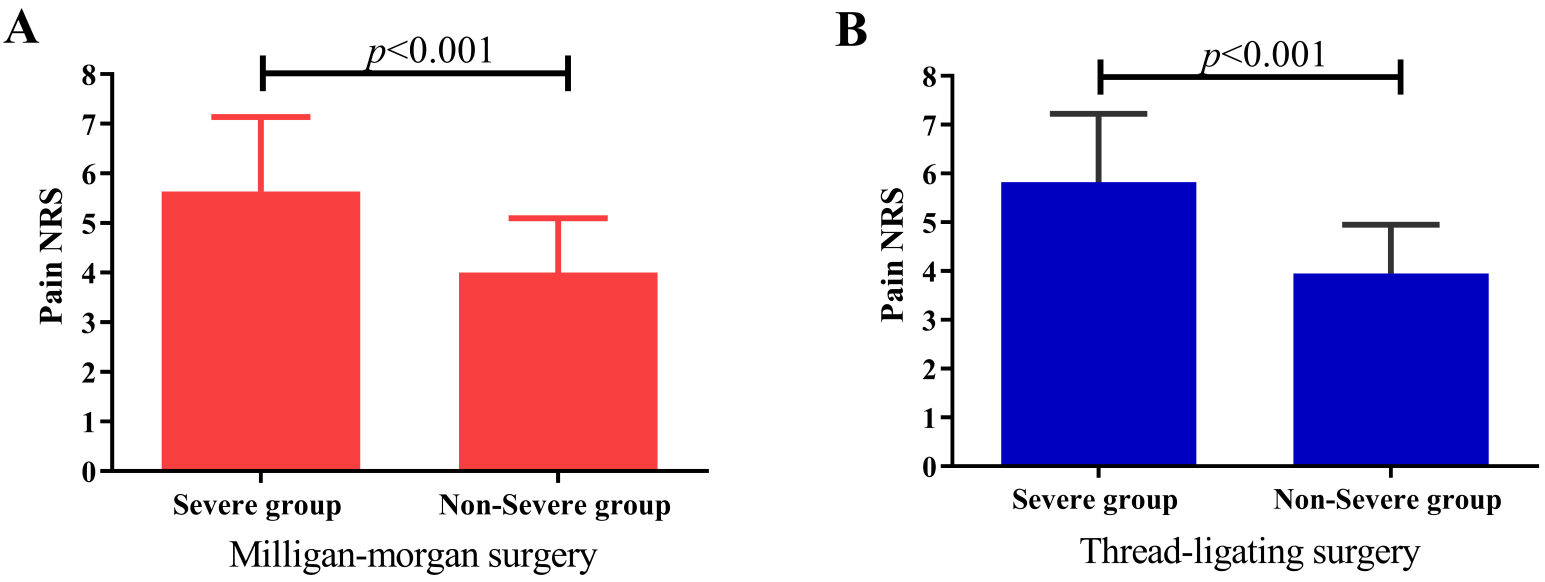

FIGURE 1. The NRS pain score for patients underwent different surgery. A: The NRS pain score between the Severe and the Non-Severe group in the subgroup analysis for patients who underwent the thread-ligating surgery. B: The NRS pain score between the Severe and the Non-Severe group in the subgroup analysis for patients who underwent the Milligan-morgan surgery. NRS: number rating scale.

patients with no pain ($p < 0.001$). However, no significant differences in postoperative hospital stay were observed ($p > 0.05$). These findings suggest that postoperative dressing change positively impacts systematic pain management after anorectal disease surgeries, indicating the need for adequate interventions to relieve pain in these patients. First, we can conduct a gentle but fast dressing change to relieve patients' pain. Second, anesthetics could be used at the first dressing change to eliminate patients' pain during dressing changes, but after carefully assessing the risk and benefits. Likewise, painkillers could be given to patients on a scheduled basis. Lastly, optimizing the use of medications would be essential to avoid drug resistance and help eliminate or reduce adverse reactions, which can significantly reduce pain and shorten the course of the disease.

5. Conclusions

In recent decades, comprehensive research on postoperative pain control has shown remarkable developments. However, research on postoperative pain management of anorectal diseases still needs to be further optimized [20]. This study linked pain degree and duration at the first dressing change for patients with anorectal diseases post-surgery, which could help standardize the protocol of wound dressing changes in patients who had undergone post-anorectal surgery. Although this was a large cohort study, there were still some limitations, such as a lack of multicenter data, thus needing further comprehensive research. Considering these limitations, basic research should be reinforced, an evaluation of therapeutics should be widely performed, and accurate and rigorous reports should be made to provide a unified standard for clinical practice, a basis for standardized therapeutics to improve patient satisfaction and reduce patients' pain when changing dressings after anorectal surgery.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

AUTHOR CONTRIBUTIONS

HLG—designed the research study; HXL—performed the research; HXL, HPG and YXF—analyzed the data; HXL, HPG and HLG—wrote the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study protocol was approved by the Institutional Review Boards of West China Hospital, Sichuan University (No. 20201053). Informed consent was exempted because of its retrospective nature.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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