Design and Application of Self-made Gastrointestinal Decompression Fixation Package

Xinran Yu, Wenxuan Lyu, Chongxi Shen, Junru Li*
Harbin Medical University, Harbin 163711, Heilongjiang, China

Abstract: Objective To compare the clinical effects of homemade gastrointestinal decompression fixation package with traditional fixation methods, and to evaluate its effects on the stability of pipeline fixation, skin injury risk, nursing burden and patient satisfaction. A total of 100 general surgery patients from a tertiary hospital were randomly divided into an observation group (50 cases using custom-made gastrointestinal decompression fixation packs) and a control group (50 cases using traditional methods). Both groups received nasogastric tubes connected to negative pressure drainage systems. The observation group utilized woven bag-supported fixation devices, while the control group had no special support. Key indicators included catheter slippage rate (6%,3/50), pressure ulcer incidence (4%,2/50), fixation device replacement frequency (1.2±0.6 times/person vs. 3.8±1.1 times/person), and patient satisfaction (98%,49/50 vs. 82%,41/50). Statistical analysis showed the observation group had significantly lower catheter slippage (6%,3/50) and pressure ulcer rates (4%,2/50) compared to the control group (30%,15/50). The fixation device replacement frequency was notably lower (1.2±0.6 vs. 3.8±1.1 times/person), while patient satisfaction rates were higher (98%,49/50 vs. 82%,41/50), all with statistically significant differences ($P<0.05$). Conclusion: Custom-made gastrointestinal decompression fixation packs effectively enhance catheter stability, reduce risks of tube dislodgement and skin injuries, minimize nursing workload, improve patient comfort and satisfaction, demonstrating clinical value for widespread adoption. However, further optimization of standardized production protocols, improvement of material biocompatibility, and exploration of intelligent monitoring functions are required to promote broader application.

***Keywords*:** gastrointestinal decompression fixation pack, dislodgement rate, skin pressure injury, patient satisfaction, fixation device

1. Current situation of domestic research

1.1 Innovative design of fixing device

Domestic medical institutions and research teams have developed innovative designs for gastrointestinal decompression fixation devices. The gastric tube and decompression kit developed by Jiangsu Province's Su Bei People's Hospital features nasal fixation with reinforced cotton straps, effectively addressing the issue of traditional adhesive tape slippage and enhancing nursing outcomes [1]. Meanwhile, Xingtai Ninth Hospital in Hebei Province introduced an improved gastrointestinal decompression device. Its design incorporates a small non-woven fabric bag with shoulder straps, allowing patients to carry it diagonally like a backpack. This ergonomic solution not only frees up hands but also significantly reduces the risk of catheter slippage [2].

1.2 Application of new fixed bags

Numerous studies have demonstrated the significant advantages of custom-made gastrointestinal decompression fixation bags in clinical practice. The Emergency Department of Guizhou Provincial People's Hospital has achieved notable reductions in accidental tube dislodgement rates among patients using their self-developed negative pressure drainage fixation bags, while simultaneously alleviating anxiety caused by tube slippage [3]. Research confirms that these custom-made woven bags effectively minimize tube dislodgement incidents in gastrointestinal decompression patients.

1.3 Portable fixtures

To address the needs of pediatric patients and those with high activity levels, domestic researchers have developed portable gastrointestinal decompression fixation devices. The pediatric portable gastrointestinal decompression fixation device created by Cheng Lin and colleagues features a disposable plastic bag integrated with shoulder straps, facilitating bed mobility while preventing gastric tube dislodgement [4]. Numerous studies demonstrate that self-made gastrointestinal decompression fixation devices show remarkable clinical effectiveness. The implementation of self-developed suspended

negative pressure drainage pouches has significantly reduced the incidence of unplanned tube removal and improved patient comfort [5]. Research on self-made gastric tube fixation belts confirms their ability to substantially decrease gastric tube dislodgement rates while enhancing patient satisfaction.

2. Current situation of foreign research

2.1 Popularization of negative pressure suction technology

Gastrointestinal decompression technology is widely used abroad, with negative pressure suction devices serving as one of its core components. International research primarily focuses on optimizing the structural design and operational convenience of these devices. For instance, improved gastrointestinal decompression devices abroad typically employ spring steel wires and adjustable valves to enhance fixation effectiveness and ease of operation.

2.2 Personalized design

Foreign research teams focus on personalized design according to patients' anatomical structure and needs to reduce discomfort and improve compliance.

2.3 Application of materials

Foreign studies have also attempted to use new materials to improve the comfort and durability of gastrointestinal decompression devices. For example, some devices use elastic cotton material to make gastric tube fixation belts to reduce the sense of pressure on patients.

2.4 Development trend of self-made gastrointestinal decompression fixation package

Research Highlights: Domestic studies focus on innovative design of fixation devices, material selection, and clinical efficacy validation; international research emphasizes optimization of negative pressure suction technology, personalized design, and intelligent development. Core Value Proposition: Enhances gastrointestinal decompression safety, effectiveness, patient comfort, and compliance. Future Directions: Technological innovation, interdisciplinary collaboration, and standardized promotion.

3. Research objectives and methods

3.1 Subjects

This study enrolled general surgery patients from a tertiary hospital, with 50 cases in each group (observation group using custom-made gastrointestinal decompression fixation packs vs. control group using conventional fixation devices) assigned by random number table. Baseline data including gender, age, and underlying conditions showed comparable distributions between groups (P>0.05). Disease distribution: Observation group included 18 acute pancreatitis cases, 9 gastric cancer cases, 17 intestinal obstruction cases, and 6 gastrointestinal perforation cases; control group comprised 16,10,18, and 6 cases respectively. Chi-square test results indicated no statistically significant difference in disease composition between groups (all P>0.05). The well-designed study provides a solid foundation for exploring the application value of custom-made fixation packs in managing various gastrointestinal disorders, as detailed in Table 1 below.

Table 1. Comparison of diseases between observation group and control group

Group	Acute pancreatitis	Gastric cancer	Ileac pssion	Digestive tract perforation
Observation group	18	9	17	6
Control group	16	10	18	6
X2 value	0.178	0.065	0.044	0.000
P price	0.672	0.799	0.834	1.000

3.2 Methodology

Study Design: A randomized digital table method was employed to assign eligible patients to observation and control groups, with standardized nursing protocols implemented to eliminate confounding variables. Shared Intervention: Both groups underwent nasogastric tube insertion connected to a negative pressure drainage device for gastrointestinal decompression. Group Differences: Control group: Traditional fixed method without drainage support structure at the end required assistance from healthcare staff/family members, limiting activity autonomy and reducing nursing efficiency; Observation group: Custom-made gastrointestinal decompression fixation kit using woven bag support for negative pressure

drainage device.

3.3 Observing indicators

This study evaluated the safety and practical value of a self-developed fixation kit through four key indicators: catheter slippage rate, pressure ulcer incidence, device replacement frequency, and patient satisfaction. The observation group employed a structurally robust yet flexible woven fixation bag for gastric tube placement, demonstrating significant advantages over traditional non-support methods: 1. Catheter stability: A marked reduction in slippage rates with enhanced fixation effectiveness; 2. Skin protection: Distributed localized pressure reduced pressure ulcer risks; 3. Nursing efficiency: Substantial decrease in average device replacement frequency, extended usage duration, and minimized maintenance workload; 4. Patient experience: High ratings for comfort and mobility convenience, achieving 98% satisfaction. Comprehensive analysis indicates this fixation kit exhibits outstanding clinical benefits and demonstrates excellent potential for clinical implementation. Detailed comparisons are presented in Table 2.

Table 2. Comparison between observation group and control group

Observing indicators	Observation group (Self-made fixed package)	Control group (traditional methods)	χ^2 price	P price
Pipeline slip rate (%)	6% (3/50)	30% (15/50)	13.043	0
Skin pressure injury incidence (%)	4% (2/50)	14% (7/50)	3.846	0.05
Frequency of fixture replacement (times/person)	1.2 ± 0.6	3.8 ± 1.1	—	<0.01*
Patient satisfaction (%)	98% (49/50)	82% (41/50)	6.993	0.008

4. Discussion

4.1 Core strengths

This specially designed protective sleeve delivers multiple clinical benefits through optimized engineering: Its reinforced structure reduces catheter slippage risks while ensuring secure and continuous drainage. The breathable material minimizes local pressure, significantly lowering the incidence of pressure ulcers—particularly beneficial for high-risk patients such as elderly individuals and those with weakened constitutions, while enhancing wearing comfort and mobility. With its user-friendly operation, readily available materials, and cost-effectiveness, it reduces repetitive tasks for nurses and improves care efficiency. Clinical data shows marked improvements in patient compliance and satisfaction, demonstrating strong potential for widespread adoption.

4.2 Existing problems and limitations

The application still requires improvements: A small number of patients experience mild skin pressure marks or discomfort, and high-risk groups need enhanced skin examinations to prevent pressure injuries; repeated use may compromise structural stability due to moisture, dirt, or repeated pulling, necessitating regular replacement; variations in nursing procedures and individual patient factors may affect data objectivity, while indicators like "patient satisfaction" carry subjective biases. Additionally, production standards, material durability, and risk warning mechanisms remain underdeveloped and require further optimization.

4.3 Future optimization direction

The technical upgrade initiative proposes three key approaches: First, conducting multicenter, large-scale long-term clinical trials to validate its applicability and long-term efficacy across diverse patient groups with varying medical conditions and surgical approaches, while integrating cost-effectiveness analysis and nursing satisfaction evaluations to establish clear economic value. Second, standardizing production processes and improving material durability and biocompatibility through optimized designs. Third, developing intelligent monitoring systems that provide real-time alerts for skin pressure and fixation stability, thereby advancing precision nursing practices. Currently, the fixation pack has achieved 98% patient satisfaction with significantly reduced catheter slippage rates. After systematic optimization, it is poised to become a standard clinical care tool.

References

[1] Juan Chen, Yan Wang, Ping Xie, et al. Design and Application of Gastric Tube and Gastrointestinal Decompression Bag. Chinese Journal of Modern Nursing, 2015,21(22):2715-2716.

[2] Lu Mei, Xiang Yang. Design and Application Effects of the Novel Gastrointestinal Decompression Negative Pressure Drainage Fixation Bag [J]. Contemporary Nurses (Mid-Year Issue), 2020,27(2):187-188.

[3] Yuan Lei, Jianghong Zeng, Xiuying Hu. Clinical Application of Self-Made Woven Bags in Preventing Tube Dislodgement in Gastrointestinal Decompression Patients [J]. China Medical Engineering, 2017,25(01):87-88.

[4] Lin Cheng, Lianjie Hou, Xiaoyan Zeng. The Production and Application of Portable Gastrointestinal Decompression Fixators for Children [J]. China Journal of Practical Nursing, 2012,28(36):40-40.

[5] Ling Ji, Haihong Wan,Aijun Zhou, et al. Application of Self-Constructed Suspended Negative Pressure Drainage Bag in Gastrointestinal Decompression Patients [J]. Qilu Nursing Journal, 2023,29(13):158-160.