

Original Article

Influence of comprehensive nursing cooperation on complications and quality of life in patients with video laryngoscope-guided orotracheal intubation in lateral decubitus position

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Abstract: Objective: To retrospectively analyze the influence of nursing cooperation on complications and quality of life (QoL) in patients with video laryngoscope-guided orotracheal intubation in a lateral decubitus position (LDP). Methods: A total of 130 patients with orotracheal intubation under general anesthesia in LDP from January 2020 to December 2021 were included and grouped based on the nursing model they received, with 65 patients receiving routine nursing cooperation during operation being included in a control group (the Con), and 65 patients receiving comprehensive nursing cooperation on the basis of the Con being included in an observation group (the Obs). The effect of the two nursing intervention models on acute pressure ulcer degree, complications, doctor-patient satisfaction, duration and area of pressure injury, nursing costs, and QoL were compared. Results: The incidence of intraoperative acute pressure injury differed significantly between the Obs (3.08%) and the Con (21.54%) ($P < 0.05$). The Obs also showed lower incidences of complications such as pressure injury, limb swelling, limb numbness and muscle soreness than the Con did ($P < 0.05$). The satisfaction of nurses, patients, anesthesiologists and surgeons in the Obs group were all 100.00%, which was higher than those in the Con (93.85%, 89.23%, 92.31% and 90.77%, respectively). Patients in the Obs had shorter duration of pressure injury, smaller pressure injury area and less nursing cost ($P < 0.05$). After nursing, the scores of social/physical functioning, vitality, role-emotional/physical, mental health, and bodily pain were all better in the Obs than in the Con ($P < 0.05$). Conclusions: The implementation of comprehensive nursing cooperation for patients with video laryngoscope-guided orotracheal intubation in LDP can reduce the incidence of complications, lower the degree of acute pressure injury, improve doctor-patient satisfaction, and enhance the QoL of patients.

Keywords: Quality of life, tracheal intubation, video laryngoscope, lateral decubitus position, comprehensive nursing cooperation

Introduction

Lateral decubitus position (LDP) is one of the main surgical postures in clinical practice. It is often used in orthopedics, thoracic surgery and urology. In the past, when patients undergoing endotracheal intubation and general anesthesia, a supine position is usually chose for the induction of intubation, after which the patients are placed in a LDP by the medical workers [1]. However, intubation in LDP may be required for special emergencies, such as intraoperative airway loss, trauma and inadequate regional

anesthesia procedures (patients require general anesthesia instead) [2, 3]. Due to muscular relaxation and the disappearance of consciousness of patients after anesthesia, it is time-consuming and laborious for medical workers to position the patients, especially for heavy patients. Moreover, post-anesthesia patients lose their self-protection function, then re-position by the medical workers may induce drastic changes in hemodynamics and limb injuries that adversely affect the surgical treatment [4, 5]. Video laryngoscope-guided orotracheal intubation in LDP, however, enables patients to be

Tracheal intubation through oral visual laryngoscope

in a conscious state, which can avoid the disadvantages of changing the patients' position during the operation or affecting the surgical field of vision [6]. However, it still leads to intraoperative complications, among which acute pressure injury has the highest incidence, adversely affecting patients' postoperative rehabilitation and quality of life (QoL) [7]. Therefore, it is of great significance to reduce the complications and improve patients' QoL with reasonable and effective nursing interventions.

Comprehensive care is a patient-centered approach that focuses on improving the quality of patient care. It not only considers the patient's recovery of symptoms and improvement of physical functions, but also takes into account the prevention of postoperative complications and improvement of QoL, so as to meet the overall needs of patients [8, 9]. Conversely, the current conventional nursing models may not meet the complex healthcare needs of patients. Hence, for patients with video laryngoscope-guided endotracheal intubation in LDP, it is urgent to explore the clinical effect of comprehensive nursing [10]. This can not only fill in the research gap, but also provide an attempt and clinical basis to optimize the nursing interventions for such patients, which is also the innovation of this study. In the present research, 130 patients with tracheal intubation under general anesthesia in LDP from January 2020 to December 2021 were studied to clarify the beneficial effect of comprehensive nursing cooperation.

Materials and methods

Baseline information

In this retrospective study, 130 patients who received video laryngoscope-guided orotracheal intubation under general anesthesia in LDP from January, 2020 to December, 2021 were selected and grouped based on the different care models, with 65 cases in each group. In the control group (the Con), there were 35 males and 30 females, aged 20-72 years (mean: 57.13 ± 10.45), with a body weight of 40-83 kg (mean: 62.01 ± 9.44). The observation group (the Obs) was composed of 40 males and 25 females that aged 21-75 years (mean: 56.80 ± 10.52), with a body weight of 41-80 kg (mean: 61.77 ± 9.53). The baseline data of the two groups were comparable ($P > 0.05$). The

study had obtained approval from the Ethics Committee of First People's Hospital of Pinghu City.

Patients were eligible if they were aged 18 or above, had mobility of the head and neck, possessed a normal range of nail-chin spacing and mouth opening, were graded I-III in the American Society of Anesthesiologists (ASA) scale [11], and voluntarily participated in this research after informing them of relevant information.

Patient were excluded if they had pain in rotational position due to lower limb fracture, required one-lung ventilation, were graded 3-4 in Mallampati scale, had limited neck movement or mouth opening (less than 3 cm), or had body mass index over 30 kg/m².

Methods

To perform video laryngoscope-guided orotracheal intubation, the doctor held the video laryngoscope in the left hand, separated the upper lip and opened the upper and lower incisors of the patient with the fingers of the right hand. Then, with the left hand, the doctor placed the laryngoscope lens into the mouth along the patient's tongue surface from the incisor, moved the laryngoscope lens to the root of the patient's epiglottis through the visual display of the laryngoscope, and adjusted the position of the lens in real time to expose the patient's glottis. The endotracheal catheter was then pushed from the right side of the patient's mouth to a suitable depth along the laryngoscope at the glottis, followed by laryngoscope removal and catheter fixation.

Patients in both groups received video laryngoscope-guided orotracheal intubation under general anesthesia in LDP. Patients in the Con were given routine nursing cooperation interventions, including preoperative assistance to complete various tests, preoperative notification, itinerant nurses' routine cooperation, and instrument nurses' collaboration.

On the basis of the Con, the Obs was given comprehensive nursing cooperation interventions: (1) Education: before operation, patients were given one-on-one education to inform them of the anesthesia mode, the advantages of LDP, the possible intraoperative complica-

Tracheal intubation through oral visual laryngoscope

tions, the significance and purpose of nursing cooperation, so as to improve patients' understanding of video laryngoscope-guided orotracheal intubation under general anesthesia. The nurses also instructed patients about how to cooperate in holding the LDP and obtained their recognition, so as to reduce their sense of strangeness and improve patient cooperation. (2) Psychological intervention: surgical patients generally experience varying degrees of anxiety and depression before the operation. Hence, the nurses evaluated patients' psychological state and gave targeted psychological care pre-operatively targeting their negative emotions. In addition, the family members of patients were instructed to give more care and attention to patients to help them establish confidence in the treatment. (3) Protective nursing: ① Protection of reproductive organs against crushing: the LDP may lead to crushing of male genitals, female breasts and other body parts, as the patient's self-protection consciousness disappears after anesthesia. Hence, the nurses were especially careful when placing the patients to avoid such squeezing. When using orthopedic traction operating beds and pelvic fixators during surgery, protective work was carried out to prevent pressure injuries to the female perineum and breasts and to the male genitalia. ② Protection of skin pressure injuries: when a patient is in LDP, the pressure points are lateral malleolus, medial and lateral knee joints, hip, elbow, shoulder and ear, which bear all the body pressure. These parts, all of which are bony prominence and weak in muscle and fat, are predisposed to skin and subcutaneous tissue damage under long-term pressure, resulting in pressure injuries. Therefore, when the patient was in LDP, a gel cushion was used to protect the corresponding pressed part, and the auricle was placed in the empty part of the head ring to fix the head. The thoracoabdominal stent was hollow to avoid affecting the patient's breathing. The knees were staggered, and a cushion was placed between the knees. In addition, the patient's muscles were in a relaxed state under anesthesia, and the limbs lacked autonomic regulation function. Therefore, excessive abduction and traction were avoided during the operation, and the body position was reasonably arranged according to the anatomic relationships to prevent peripheral nerve damage. Furthermore, attention was paid to the protection of each pipeline

to prevent it from folding and/or being pressed during operation. Moreover, all kinds of fabrics used by patients were guaranteed to be soft and flat in texture with good air permeability, and the bed sheet underneath the body was checked to be free of wrinkles. Also, the suture edge was not pressed under the patient's body. (4) Prevention of complications: ① Complications of circulatory system: patients' local limbs get pressed for a long time in the LDP, which can cause circulatory disturbance of upper limb venous reflux. In this respect, it is necessary to ensure normal thoracic relaxation and contraction during nursing using appropriate cushions, so as to reduce chest and axillary pressure. Also, the venous patency was maintained during positioning, and the vital signs of patients were closely observed. During the operation, the patient's distal limb was placed higher than the proximal limb to promote blood reflux. ② Respiratory complications: the placement of cushions under the chest and armpit in the LDP may affect the patient's breathing. To prevent upper respiratory tract obstruction, the nurses kept a close eye on whether the catheter was unblocked, so as to avoid conditions affecting the patient's breathing, such as catheter bending. During endotracheal intubation, the medical workers performed the operation gently under the guidance of the video laryngoscope, so as to prevent the patient's airway mucosa from being damaged. ③ Hypothermia: hypothermia during surgery was actively prevented by applying carbon fiber material to the infusion site to keep the patients warm. The patient's body exposure was minimized, and the room temperature and humidity of the operating room were adjusted to maintain the patient's body surface at a suitable temperature.

Outcome measures

Acute pressure injury was evaluated and recorded in both groups during the operation according to the staging standard recommended by the US National Pressure Injury Advisory Panel. Stage I: the pressing and nonblanchable erythema appeared and lasted for 2 observation days after pressing the skin of the same part with a colorless transparent glass for 3 s. Stage II: there were crater-like ulcers, skin blisters, or breakage at the compression site, with

Tracheal intubation through oral visual laryngoscope

Table 1. General data of the two groups of patients (% , $\bar{x} \pm s$)

Factor	n	Observation group (n=65)	Control group (n=65)	χ^2	P
Sex				0.788	0.375
Male	75	40 (61.54)	35 (53.85)		
Female	55	25 (38.46)	30 (46.15)		
Age (years)	130	56.80±10.52	57.13±10.45	0.179	0.858
Body mass index (kg)	130	61.77±9.53	62.01±9.44	0.144	0.886
Disease type				0.521	0.771
Ankylosing spondylitis	41	22 (33.85)	19 (29.23)		
Femoral neck fracture	60	28 (43.08)	32 (49.23)		
Severe asthma	29	15 (23.08)	14 (21.54)		

Table 2. Occurrence of intraoperative acute pressure injury in two groups (%)

Group	n	I	II	Total
Observation group	65	2	0	3.08%
Control group	65	11	3	21.54%
χ^2	-	6.923	3.070	10.263
P	-	0.008	0.079	0.001

the presence of superficial ulcers, and epidermal or dermal damage [12].

The complications of the two groups were recorded, including pressure injury, limb swelling, limb numbness, muscle soreness, respiratory mucosa injury, and oxygenation deficiency.

A self-designed satisfaction questionnaire was used to evaluate the satisfaction (satisfied or dissatisfied) of anesthesiologists, nurses, surgeons and patients, and the results were statistically analyzed.

Patients' QoL was measured by the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36), which included 36 questions on social functioning, vitality, emotional, and mental health, bodily pain, physical functioning and role of physical scales, with a total score of 100 points for each dimension. The score is positively associated with patients' QoL.

Statistical analysis

The data were analyzed using the SPSS21.0 statistical software. The counted data were expressed as percentages (%) and compared by χ^2 test. The measured data were expressed

as ($\bar{x} \pm s$) and compared by t test. Significant differences were indicated if $P < 0.05$.

Results

Comparison of general data

Comparing patients' general data, it was found that the two groups were not statistically different in sex, age, body mass index, disease types, or other general data, indicating that the groups were clinically comparable ($P > 0.05$; **Table 1**).

Comparison of the incidence of intraoperative acute pressure injury

The total incidence of intraoperative acute pressure injury in the Obs was 3.08% (all stage I), while the incidence in the Con was 21.54%. The inter-group comparison revealed a markedly lower incidence in the Obs ($P < 0.05$) (**Table 2**). In the Con, the area of pressure injury was 1.9 cm*4.1 cm-2.6 cm*4.5 cm, mainly distributed in the anterior superior iliac spine, the acromion, the underarm chest wall on the axillary pad and the auricle, and no stage III or IV pressure injury occurred in this group.

Comparison of complications

The incidences of oxygenation deficiency and mucosal injury in the Obs were not statistically different from those of the Con ($P > 0.05$). However, there was a difference in the incidence of pressure injury, limb swelling, limb numbness, and muscle soreness between the two groups, with lower incidences in the Obs ($P < 0.05$) (**Table 3**).

Tracheal intubation through oral visual laryngoscope

Table 3. Comparison of incidence of complications (%)

Group	n	Pressure injury	Limb swelling	Limb numbness	Muscle soreness	Mucosal injury	Oxygenation deficiency
Observation group	65	2	3	1	3	4	1
Control group	65	14	10	7	11	3	0
χ^2	-	10.263	4.188	4.795	5.123	0.151	1.007
<i>P</i>	-	0.001	0.040	0.028	0.023	0.697	0.315

Table 4. Comparison of doctor-patient satisfaction (%)

Group	n	Anesthesiologists' satisfaction with intubation safety	Nurses' satisfaction	Surgeons' satisfaction	Patient satisfaction
Observation group	65	65 (100.00%)	65 (100.00%)	65 (100.00%)	65 (100.00%)
Control group	65	60 (92.31%)	61 (93.85%)	59 (90.77%)	58 (89.23%)
χ^2	-	5.200	4.127	6.290	7.398
<i>P</i>	-	0.022	0.042	0.012	0.006

Table 5. Comparison of pressure injury area, duration, and nursing costs ($\bar{x} \pm s$)

Group	n	Duration of pressure injury (d)	Pressure injury area (cm)	Nursing related expenses (yuan)
Observation group	65	1.86±0.34	2.03±0.25	207.10±24.22
Control group	65	4.15±0.87	4.66±0.40	541.23±32.36
<i>t</i>	-	19.765	44.951	66.646
<i>P</i>	-	<0.001	<0.001	<0.001

Comparison of doctor-patient satisfaction

The satisfaction rates of nurses, patients, anesthesiologists, and surgeons in the Obs were all 100.00%, higher than those in the Con (93.85%, 89.23%, 92.31% and 90.77%, respectively), with statistical significance ($P < 0.05$, **Table 4**).

Comparison of related indicators

The Obs presented a shorter duration of pressure injury, smaller pressure injury area, and less nursing cost than the Con did (all $P < 0.05$) (**Table 5**).

Comparison of quality of life, QoL

No significant inter-group difference in QoL was assessed before nursing ($P > 0.05$). After nursing, obvious increases in all scales were observed in both groups ($P < 0.05$), with more significant increases in the Obs ($P < 0.05$, **Table 6**).

Discussion

The safety of surgical postures is critical for surgical risk management. In the past clinical practice, patients had to be intubated in a supine position before being placed in LDP by medical workers in an unconscious state. With the recent development of surgical medicine, some scholars have pointed out that there are many disadvantages to this traditional way, which not only adversely affect patients' surgical experience and outcomes, but also increase the workload for medical workers [13].

At present, there are increasing reports about general anesthesia of tracheal intubation in LDP position, such as video laryngoscope-guided orotracheal intubation in the LDP [14]. In this way, patients can be in a conscious state and participate in posture adjustment independently or in coordination with medical workers according to the patient's first experience and clinical surgical needs, so that the patient's body is in a functional and comfortable position, thus meeting the basic requirements of the operation [15]. Jin et al. [16] reported that video laryngoscope-guided endotracheal intubation in the left lateral position was effective in preventing hemodynamic abnormalities and sore throat that are associated with bedsores. It was suggested that it is safer, more convenient, and feasible to place the patient in LDP when the patient is awake. However, some

Tracheal intubation through oral visual laryngoscope

Table 6. Comparison of quality of life (SF-36 scores) between the two groups before and after nursing ($\bar{x} \pm s$, points)

Group	Time	Social Functioning	Vitality	Role-emotional	Mental health	Bodily pain	Role-physical	Physical functioning
Observation group n=65	Before nursing	68.63±9.32	66.50±7.65	70.13±10.35	58.63±8.77	59.35±9.30	53.11±8.86	52.73±9.81
	After nursing	85.42±11.66*	81.22±13.24*	91.42±12.80*	77.89±12.68*	71.96±11.78*	69.69±11.53*	76.24±11.76*
Control group n=65	Before nursing	69.01±9.28	66.44±8.72	70.20±9.89	58.34±8.60	59.45±9.12	53.32±8.78	53.06±9.85
	After nursing	74.80±12.54#*	70.68±12.35#*	76.55±11.52#*	68.32±11.73#*	64.53±10.71#*	61.01±9.26#*	63.42±10.50#*

Note: Compared to the score before nursing, *P<0.05; compared to the observation group, #P<0.05.

Tracheal intubation through oral visual laryngoscope

scholars believed that it is harder to manage the airway and intubate the trachea in LDP, and can easily cause larynx and esophageal intubation-induced mucosal injury [17, 18].

Using tracheal intubation guided by a video laryngoscope, the glottis can be well-exposed under direct vision of a video lens, thus improving the first-time success rate of intubation, and reducing the difficulties of tracheal intubation and the damage to airway mucosa [19, 20]. However, in clinical practice, patients need to maintain the LDP for a long time, resulting in prolonged compression of the skin and tissues on the lower surface, which inevitably leads to complications such as pressure injury, limb numbness, and muscle soreness [21]. Therefore, how to reduce complications is an urgent issue to be addressed in clinical surgical nursing.

Comprehensive nursing follows the “people-oriented” principle, integrates the advantages of accountability and team nursing models to provide comprehensive, continuous and high-quality nursing for patients, and strengthens the nurse-patient communication to enhance cooperation and promote the smooth completion of nursing work [22, 23]. This study showed that the proportion of intraoperative acute pressure injury, duration and area of acute pressure injury, and nursing costs were all lower in the Obs than those in the Con ($P < 0.05$), suggesting benefits of comprehensive nursing cooperation. This may be attributed to the protective care of patients against skin stress injury in the comprehensive nursing process, the targeted gel cushion protection given to different body parts that may bear the pressure in the LDP, the avoidance of excessive abduction, pulling, and other behaviors during the operation, and the postoperative bed comfort care, all of which reduced the risk of acute pressure injury. This is, similar to the measures taken by Yilmazer et al. [24] to prevent pressure ulcers. Besides, the incidences of complications such as pressure injury, limb numbness, muscle soreness, and limb swelling were statistically lower in the Obs than those in the Con ($P < 0.05$), indicating that comprehensive nursing cooperation can reduce these complications. Comprehensive nursing has been indicated to significantly reduce the complications of stroke and brain tumor surgery [25, 26], similar to our

research results. In the nursing process, preventive measures were designed for possible circulatory and respiratory system complications and hypothermia, and corresponding protections were given to the organs, limbs, muscles, and skin of patients from the perspective of comfortable position management, all of which have been confirmed to prevent perioperative complications [27]. Carrying out health education and psychological intervention on the basis of routine nursing cooperation can improve patients' understanding and cooperation with nursing, reduce their psychological burden, and lower the risk of intraoperative stress reactions, thus preventing complications, as demonstrated by the study of Xue et al. [28]. In addition, posture nursing and complication nursing can provide targeted protection for patients' compressed body parts and special parts to reduce the incidence of pressure injury. This study determined a higher satisfaction in medical workers and patients and better QoL in patients after nursing in the Obs ($P < 0.05$), suggesting that comprehensive nursing cooperation interventions can improve doctor-patient satisfaction and improve patients' QoL. Wei et al. reported that comprehensive nursing can significantly improve nursing satisfaction and QoL of perioperative gallstone patients, which is consistent with our findings [29]. A possible reason is that comprehensive nursing has implemented careful nursing measures from four major aspects, including education, psychological intervention, postural protection nursing, and complications prevention, which give patients a better treatment experience than conventional nursing [30].

This study has the following limitations. 1) The results were based on a small sample size, which needs to be expanded in the future to improve the accuracy of the results. 2) Obese patients with body mass index over 30 kg/m^2 were not included in the clinical analysis, so supplementing the sample data of this population would further improve the universality of the results of this study. This study proposed a high-quality comprehensive nursing method for patients with video laryngoscope-guided orotracheal intubation in LDP. This nursing strategy is of great significance to improve the perioperative treatment experience of such patients and is conducive to avoiding the occurrence of acute pressure ulcers and other com-

Tracheal intubation through oral visual laryngoscope

plications, thereby further improving doctor-patient satisfaction and patients' QoL while reducing care-related costs, with excellent clinical promotion value.

In sum, the application of comprehensive nursing cooperation in video laryngoscope-guided orotracheal intubation in LDP can reduce the incidence of complications and improve patients' QoL.

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Tracheal intubation through oral visual laryngoscope

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