Comparative efficacy of awake prone positioning combined with standardized nursing care and standardized nursing care in the prevention of early postoperative pulmonary complications in elderly patients with hip fracture

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Abstract

INTRODUCTION: To compare the effectiveness of awake prone positioning (APP) care combined with standardized nursing and standardized nursing care in the prevention of early postoperative pulmonary complications (PPCs) in elderly patients with hip fracture.

METHODS: A prospective cohort study was conducted to analyze the clinical data of 84 elderly patients with hip fracture Admitted to Zhongda Hospital Affiliated to Southeast University from February 2025 to August 2025. There were 31 males and 53 females, aged 67-96 years [(82.3±6.3) years]. Fracture types were femoral neck fracture (n=45) and intertrochanteric fracture (n=39). Surgical procedures included closed reduction internal fixation (n=39), hip hemiarthroplasty (n=35), and total hip arthroplasty (n=10). Among them, 42 patients received standardized nursing care and APP intervention (APP combined with standardized nursing care group), while the remaining 42 patients received standardized nursing care only (standardized nursing care group). The incidence rate of PPCs (including pneumonia, respiratory failure, pleural effusion, atelectasis and pulmonary edema) within 30 postoperative days, arterial oxygen pressure (PaO_2), arterial carbon dioxide pressure ($PaCO_2$), arterial oxygen saturation (SaO_2) on the 4th postoperative day, difference in PaO_2 between the 4th postoperative day and emergency visit, clinical pulmonary infection score (CPIS) on the 4th postoperative day, and number of adverse events related to APP were compared between the two groups.

RESULTS SECTION: All the patients were followed up for 30-90 days [(86.1±16.5) days]. The incidence rates of PPCs and type 1 postoperative respiratory failure in the APP combined with standardized nursing care group were 16.7% (7/42) and 4.8% (2/42), and were 35.7% (15/42) and 21.4% (9/42) in the standardized nursing care group (all $P<0.05$). The PaO_2 and SaO_2 on the 4th postoperative day, and difference in PaO_2 between the 4th postoperative day and emergency visit were (82.0±8.8) mmHg, 0.96±0.01, and 3.2 (-1.9, 8.0) mmHg in the APP combined with standardized nursing care group, and were (74.3±12.1) mmHg, 0.94±0.03, and -7.6 (-17.2, 1.1) mmHg in the standardized nursing care group (all $P<0.01$). The CPIS on the 4th postoperative day was 2.0 (1.0, 3.0) points in the APP combined with standardized nursing care group and 4.0 (1.0, 7.0) points in the standardized nursing care group ($P<0.05$). No statistically significant differences were observed in the incidence of pneumonia, type I respiratory failure, pleural effusion, atelectasis, and pulmonary edema within 30 postoperative days, as well as $PaCO_2$ on the 4th postoperative day between the two groups (all $P>0.05$). None of the patients experienced adverse events related to APP.

DISCUSSION: For elderly patients with hip fracture, compared with standardized nursing care, application of APP combined with standardized nursing care can significantly decrease the incidence rate of early PPCs, especially type I respiratory failure, and improve postoperative oxygenation.

SIGNIFICANCE/CLINICAL RELEVANCE: This study confirms that postoperative awake prone position (APP) is a safe and effective non-invasive intervention for elderly hip fracture patients, as it notably lowers the incidence of postoperative pulmonary complications (PPCs) (particularly type I respiratory failure) and improves oxygenation, addressing a critical unmet need in the perioperative care of this high-risk group.By demonstrating APP's clinical value in optimizing postoperative outcomes for elderly hip fracture patients, this research provides actionable evidence to refine clinical care protocols, which is vital for enhancing patient prognosis and alleviating the healthcare burden associated with PPCs in the aging population.

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IMAGES AND TABLES:

Table 1 Comparison of Outcome Indicators Between Two Groups of Elderly Patients with Hip Fractures

Variable	APP Group (n=42)	Standard Care Group (n=42)	χ^2/t/Z Value	P Value
Single Prone Position Duration (min, Mean ± SD)	38.6 ± 5.9	NA		
Postoperative Pulmonary Complications (PPCs) Within 30 Days	7 (16.7)	15 (35.7)	3.94	0.047
- Postoperative Pneumonia (POP)	1 (2.4)	5 (11.9)	-	0.202
- Type I Postoperative Respiratory Failure (PRF)	2 (4.8)	9 (21.4)	-	0.048
- Type II Postoperative Respiratory Failure (PRF)	1 (2.4)	1 (2.4)	-	1.000
- Pleural Effusion	5 (11.9)	8 (19.0)	1.49	0.222
- Atelectasis	0 (0)	3 (7.1)	-	0.241
- Pulmonary Edema	0 (0)	1 (2.4)	-	1.000
Arterial Blood Gas Analysis on Postoperative Day 4				
- PaO2 (mmHg, Mean ± SD)	82.0 ± 8.8	74.3 ± 12.1	3.34	0.001
- PaCO2 (mmHg, Mean ± SD)	34.0 ± 5.6	35.0 ± 5.8	-0.89	0.374
- SaO2 (%, Mean ± SD)	96.0 ± 1.4	93.8 ± 3.4	3.74	0.000
Difference in PaO2 Between Postoperative Day 4 and Emergency Visit (mmHg, Mean ± SD)	2.7 ± 10.3	-10.0 ± 14.1	4.70	0.000
Clinical Pulmonary Infection Score (CPIS) on Postoperative Day 4 [Median (Q1, Q3)]	2 (1.0, 3.0)	4.0 (1.0, 7.0)	630.00	0.022
Total Hospital Stay [d, Median (Q1, Q3)]	9.0 (9.0, 12.0)	10.0 (9.0, 13.0)	718.00	0.137
Postoperative Hospital Stay [d, Median (Q1, Q3)]	8 (6, 9)	8.0 (6.8, 10.0)	807.00	0.497