

Original Article

Effect of continuous nursing combined with salcatonin on postoperative pains in elderly patients after hip replacement

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Received January 4, 2021; Accepted February 2, 2021; Epub May 15, 2021; Published May 30, 2021

Abstract: Objective: This study was designed to explore the effect of continuous nursing combined with salcatonin on the improvements of postoperative pain in elderly patients after hip replacement. Methods: A total of 99 elderly patients treated by hip replacement in our hospital were divided into the control group (CG, n=49, routine nursing + salcatonin) and the study group (SG, n=50, continuous nursing + salcatonin). The visual analogue scale (VAS) during rest (RVAS), VAS during initiative movement (IVAS) and VAS during passive movement = (PVAS) at 3 d, 7 d, 10 d, 14 d and 30 d after operation, the Harris hip score (HHS), Barthel index and geriatric depression scale (GDS) at 1 month after operation, and the incidences of tumble and refracture during the postoperative 6-month follow-up were compared between the two groups. Results: In comparison with the CG, except for higher HHS and Barthel index at 1 month after operation ($P<0.05$), the SG was associated with lower RVAS, IVAS and PVAS at 7 d, 10 d, 14 d and 30 d after operation ($P<0.05$), lower GDS at 1 month after operation, and lower incidences of tumble and refracture during the 6 months after operation ($P<0.05$). Conclusion: The combination of continuous nursing and salcatonin has achieved marked effects not only on mitigating the pains at the early stage after a hip replacement in elderly patients, but also on improving their joint functions and reducing the incidences of tumble and refracture in a long run.

Keywords: Continuous nursing, salcatonin, elderly, hip replacement, postoperative pain, improvement effects

Introduction

With the aging of Chinese society, the incidence of various degenerative osteoarthropathies has been increasing year by year, and more and more elderly people are diagnosed with hip related diseases [1, 2] due to osteoporosis, low BMI, old fracture, muscle weakness, long-term medication and reduced exercise. Hip joint is an important articulation, which plays a significant role in maintaining the normal activities of the lower limbs. According to the research, hip fracture is the main cause of the movement disorder of the elderly. It is predicted that with the aging of the global population, the case number of hip fracture worldwide will rise from 4.5 million to 21.3 million by 2050, with 45% of these coming from Asia [3-5]. Another investigation showed that there are about 130 million people over the age of 70 in China, and 12.5% of people over 60 years of

age suffer from osteoporosis. Based on an incidence of 16% for hip fracture, the total case number of hip fracture in China will reach about 2 million [6, 7].

Clinical practices have found that the insufficient blood supply to the fracture site (FS) accounted for the slow recovery of functions in hip fracture patients. Some patients are prone to joint stiffness, nonunion or even osteonecrosis of the femoral head (ONFH) and other complications, seriously affecting the postoperative life of patients. A total hip replacement is effective in improving joint functions, and it is even considered as one of the most impactful methods against the ultimate diseases of hip joint [8, 9]. Some studies have pointed out that hip replacement can significantly improve the quality of life (QOL) and reconstruct the hip functions of patients. The number of hip replacement performed in each year would be

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1 million worldwide, of which, more than 90% succeed. Hip replacement plays a vital role in improving the QOL of the elderly patients [10]. However, in the clinical nursing practice of elderly patients after hip replacement, it is found that pain is one of the prominent complications after operation, which will not only affect the implementation of the treatment plan, but also change the hemodynamic indicators of patients, and consequently, increase the incidences of various cardiovascular events. Therefore, it is recommended to carry out early pain intervention for such patients [11]. As a parathormone, salcatonin can regulate the calcium metabolism, inhibit the activity of osteoclasts and improve bone density. It is often applied in patients with hip replacement, and works well on improving the osteoporosis in elderly patients. As a new concept emerging in recent years, continuous nursing aims to ensure that patients have access to cooperative and continuous nursing services wherever they are through a series of actions. The limitation of this nursing concept lies in its strong dependence on the external objective conditions, such as the implementation of out-of-hospital intervention by means of Internet and telephone, and its inadequate applicability to some special groups such as deaf-mutes. Compared with continuous nursing alone, the combined use of salcatonin can effectively improve the effectiveness of nursing intervention and accelerate the clinical outcomes such as pain, which has a positive significance for improving prognosis of patients. The purpose of this study was to explore the effects of continuous nursing combined with salcatonin on the improvements of postoperative pain of elderly patients after hip replacement, so as to provide a theoretical basis for improving their QOL.

Materials and methods

General materials

A total of 99 elderly patients treated by hip replacement in our hospital from January to September 2019 were divided into the control group (n=49, routine nursing + salcatonin) and the study group (n=50, continuous nursing + salcatonin).

Inclusion criteria: (1) Identification of hip fracture or traumatic arthritis through imaging diag-

nosis, and establishment of the necessity for hip replacement [12]; (2) Unilateral hip replacement; (3) Clear consciousness to cooperate with the study; (4) Complete clinical medical records; (5) ASA grades I to III; (6) This study was approved by the Ethics Committee of Nanfang Hospital, Southern Medical University; (7) Patients or their family members signed written informed consent.

Exclusion criteria: (1) Complications such as mental disorders, active infection, malignant tumors, coagulation disorders, diseases of the autoimmune system, and spinal diseases affecting the movement of lower limbs; (2) Allergic to the drug studied; (3) Long-term use of corticosteroids.

Removal criteria: (1) Died during the study; (2) Withdrew during the study.

Methods

Patients from both groups received the same preoperative evaluation. The specific steps included collection of medical records in details, implementation of laboratory tests, evaluation of cardiopulmonary, liver and kidney functions, as well as intraoperative risk factors, analysis of cardiac functions, and identification of basic diseases. Preoperative preparation was then conducted, including prohibition of food and water intake, anesthesia risk evaluation, etc. The operation was performed by the same medical team. The epidural anesthesia was performed, and an incision was made on the posterolateral side of hip joint. The prosthesis was implanted according to the standard joint replacement. All patients were required to take conventional recovery exercises after operation.

For patients in the CG, conventional postoperative nursing was combined with salcatonin. The specific measures were as follows: patients were injected with salcatonin (commodity name: Miacalcic, manufacturer: Novartis Pharma Schweiz AG, specification: 50 IU/injection, approval document No.: H20090459) at the 3 d after operation. The dose was 50 IU/time, once a day, and the course was 14 d; at the same time, routine nursing after hip replacement was performed, including wearing corrective shoes, maintaining affected limb at the neutral position and appearance observation, incision nursing, catheter nursing, turnover

nursing, mental nursing and nutritional support, etc.

For patients in the SG, continuous nursing was added into the therapeutic regimen of the CG: (1) A continuous nursing team was established with orthopedic doctors and professional nurses qualified for recovery treatment. The team was equipped with skills of recovery after a hip replacement, and assigned with the duties of passing onto patients and their family members the knowledge related to continuous nursing, and supervising the implementation of continuous nursing; (2) Health records were maintained for patients for quality tracing of continuous nursing. The records included patients' mental state, scores of hip functions and QOL; (3) Continuous nursing was performed immediately after operation. Health education and other ways were adopted to make sure patients realize its necessity and importance. A WeChat group or follow-up platform was established to facilitate communication between patients and the doctor in charge. During their days in the hospital, patients were required to take recovery exercise and training, including muscle strength, joint activity, and self-care ability, with the witness of their family members. This process ensured their mastery of the key points for correct out-of-hospital exercise; (4) After discharge, the patients were followed up through telephone, WeChat video, return visit, etc., so as to learn about their conditions; any deviation from standard recovery training was corrected in time. (5) In terms of pain management, according to the actual situation of persistent pains after operation, various measures such as medication, attention diversion, body surface massage, and acupuncture were taken as approved by patients' family members to mitigate the pain intensity.

Observation indices and evaluation criteria

Intergroup comparison of pain intensity at different time points after operation: The visual analogue scale (VAS) during rest (RVAS), VAS during initiative movement (IVAS) and VAS during passive movement (PVAS) were evaluated by the VAS at 3 d, 7 d, 10 d and 14 d after operation. VAS is a clinically common means of pain evaluation. It is designed as a straight line of 0 to 10 cm, on which, patients select a scale to indicate the pain intensity they are tolerating [13].

Intergroup comparison of hip functions and negative emotions at 1 month after operation: Hip functions, QOL and negative emotions at 1 month after operation were evaluated by HHS, Barthel index and geriatric depression scale (GDS). Harris hip scale is commonly adopted for hip and joint replacements. It consists of four items, *i.e.*, pains, functions, deformity and activity. With a full mark of 100, a higher score suggests faster recovery of hip functions [14]. Barthel index is normally used to evaluate the daily viability. The scale consists of 10 indices, such as feeding, bathing, grooming, dressing, and mobility on level surfaces. With a full mark of 100, a higher score indicates better daily viability [15]. The GDS was developed by Brank et al. in 1982 to measure the depression of the elderly. It consists of 30 items. Scores of 0-10 indicate normal conditions, 11-20 represent mild depression, and 21-30 suggest moderate and severe depression [16].

Intergroup comparison of incidences of tumble and refracture at 6 months after operation: Both groups were followed up for 6 months to record, evaluate and compare the incidences of tumble and refracture.

Statistical analysis

Statistical analysis was performed with SPSS22.0. Statistical charts were drawn by Graphpad Prism 8. In case of numerical data expressed as mean \pm standard deviation, intergroup differences were checked by Student's t test. In case of nominal data expressed as [n (%)], comparisons were carried out through χ^2 test for intergroup comparison. Student's t test was also used to analyze the difference of continuous variables. For all statistical comparisons, significance was defined as $P < 0.05$ [17].

Results

Intergroup comparison of general clinical materials

In this study, 99 subjects were enrolled, including 52 males and 47 females, aged 60-70 years, with an average age of 66.00 ± 2.11 years. The general data, such as gender, age, weight, BMI, hip replacement site, educational background, and marital status, were not significantly different ($P > 0.05$), which were comparable between the two groups (**Table 1**).

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Table 1. Intergroup comparison of general clinical materials ($\bar{x} \pm sd$)/[n (%)]

General clinical materials		SG (n=50)	CG (n=49)	t/X ²	P
Gender	Male	26	26	0.011	0.916
	Female	24	23		
Average age (year)		65.98±3.22	66.01±3.45	0.045	0.964
Average weight (kg)		60.18±3.44	59.87±3.51	0.444	0.658
Average BMI (kg/m ²)		23.19±3.21	23.21±3.45	0.105	0.917
Disease diagnosis	ONFH	23	22	0.311	0.781
	Coxarthria	17	18		
	Transcervical fracture	10	9		
Hypertension	Yes	30	30	0.016	0.901
	No	20	19		
Diabetes	Yes	19	18	0.017	0.896
	No	31	31		

Table 2. Intergroup comparison of RVAS at different time points after operation ($\bar{x} \pm sd$)

Group	n	3 d after operation	7 d after operation	10 d after operation	14 d after operation	30 d after operation
SG	50	5.39±1.22	3.18±0.41	2.49±0.31	1.89±0.21	1.21±0.11
CG	49	5.41±1.21	4.28±0.36	3.11±0.29	2.26±0.19	1.59±0.21
X ²	-	0.082	14.174	10.272	9.187	11.31
P	-	0.935	<0.001	<0.001	<0.001	<0.001

Table 3. Intergroup comparison of IVAS at different time points after operation ($\bar{x} \pm sd$)

Group	n	3 d after operation	7 d after operation	10 d after operation	14 d after operation	30 d after operation
SG	50	6.81±1.71	4.41±0.98	3.87±0.34	2.89±0.32	2.10±0.31
CG	49	6.79±1.68	5.14±0.87	4.21±0.33	3.31±0.29	2.51±0.28
X ²	-	0.059	3.917	5.048	6.839	6.901
P	-	0.953	<0.001	<0.001	<0.001	<0.001

Table 4. Intergroup comparison of PVAS at different time points after operation ($\bar{x} \pm sd$)

Group	n	3 d after operation	7 d after operation	10 d after operation	14 d after operation	30 d after operation
SG	50	5.89±1.55	4.78±0.32	4.01±0.29	2.98±0.31	2.01±0.21
CG	49	5.91±1.49	5.21±0.23	4.51±0.19	3.21±0.28	2.44±0.19
X ²	-	0.065	7.664	10.125	3.872	10.677
P	-	0.948	<0.001	<0.001	<0.001	<0.001

Intergroup comparison of pain intensity at different time points after operation

There was no significant difference in RVAS, IVAS and PVAS between the two groups at 3 d after operation ($P>0.05$). The postoperative

VAS scale scores of both groups were significantly lower than those before treatment. At 7 d, 10 d, 4 d and 30 d after operation, the scores were lower in the SG ($P<0.05$) (Tables 2-4, and Figure 1).

Intergroup comparison of hip functions, viability and negative emotions at 1 month after operation

Patients in both groups were followed up for 1 month. The hip function, QOL and negative emotions of patients in both groups were evaluated and compared at 1 month after surgery by means of re-examination. At 1 month after operation, the SG exhibited significantly higher HHS (89.18±4.32) and Barthel index (87.18±4.33) scores and significantly lower GDS score (11.28±2.11) than the CG ($P<0.05$) (Table 5 and Figure 2).

Intergroup comparison of incidences of tumble and refracture during the 6-months follow-up after operation

There were 2 cases of tumble (4.00%) and 1 case of refracture (2.00%) in the SG within 6 months after operation, while in the CG, the

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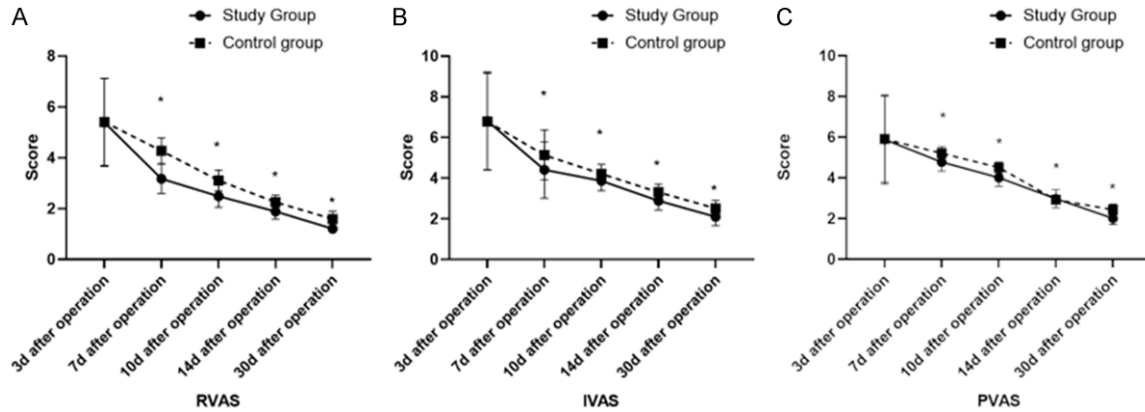


Figure 1. Intergroup comparison of pain intensity at different time points after operation. At 3 d after operation, the two groups were not statistically different in RVAS, IVAS and PVAS ($P > 0.05$). At 7 d, 10 d, 14 d and 30 d after operation, these indices were lower in the SG ($P < 0.05$) (A-C). * $P < 0.05$ vs CG at the same time point for the same index.

Table 5. Intergroup comparison of hip function, viability and negative emotion at 1 month after operation ($\bar{x} \pm sd$)

Group	n	Harris hip score	Barthel index	GDS
SG	50	89.18±4.32	87.18±4.33	11.28±2.11
CG	49	71.98±3.88	80.18±3.28	15.18±2.10
χ^2	-	20.828	9.053	9.217
<i>P</i>	-	<0.001	<0.001	<0.001

Table 6. Intergroup comparison of the incidences of tumble and refracture at 6 months after operation [n (%)]

Group	n	Tumble	Refracture
SG	50	2 (4.00)	1 (2.00)
CG	49	8 (16.33)	6 (12.24)
χ^2	-	4.141	3.953
<i>P</i>	-	0.042	0.047

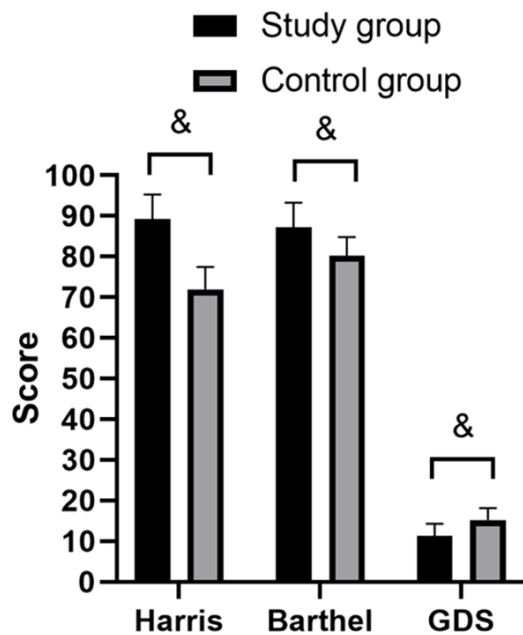


Figure 2. Intergroup comparison of hip function, viability and negative emotions at 1 month after operation. At 1 month after operation, the SG had significantly higher HHS and Barthel index, and lower GDS ($P < 0.05$). & $P < 0.05$ vs CG for the same index.

corresponding cases were 8 (16.33%) and 6 (12.24%). The incidences of tumble and refracture in the SG were lower than those in the CG, showing significant difference ($P < 0.05$) (Table 6).

Discussion

Hip replacement is an effective operation against osteoarthritis, rheumatoid arthritis, traumatic arthritis, ONFH, congenital hip dysplasia and transcervical fracture. It ranks the second only after cholecystectomy in western countries, which is related to increasing clinical application on a yearly basis in the wave of global aging [18]. According to clinical studies, hip replacement was introduced into China in the 1970s and widely promoted in the 1990s. After decades of development, hip replacement has become one of the most successful and widely used orthopaedic operations in China, with a success rate of more than 90% and the annual case number of 200,000. It has played an important role in improving the QOL of elderly patients and reducing the rate of disability [19].

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According to clinical practice, pain is one of the common postoperative complications in patients with hip replacement, especially in the elderly patients who require more time for recovery due to physical dysfunction and slow functional recovery. Continuous pain will affect clinical treatment and increase the incidence of various risk events in patients with underlying diseases [20]. A survey of 98 elderly patients after hip replacement found that 3d after replacement, the average VAS was 6.10 ± 0.32 , and among the included patients, 81.63% complained that pain affected the recovery exercise, 51.02% requested to take analgesics, and 52.04% rejected further recovery treatment because of pain [21]. It suggested that the pain had seriously affected the postoperative recovery treatment in the elderly patients and obviously jeopardized the recovery of joint function. Some studies reported negative emotions caused by postoperative pain, which significantly increased the incidence of anxiety and depression. The results of a study in 112 elderly patients after hip replacement showed that at 3 d after operation, of 55 patients with a VAS score higher than 5.0, 41 had higher HAMA score and 26 had higher HAMD score above the norm, and these patients were obviously depressed and anxious in the recovery training. Further interviews suggested that the negative emotions were the result of pains affecting sleep and eating [22].

Although the routine nursing has a significant effect on reducing the incidence of complications such as infection and deformity, for the elderly patients after hip replacement, there are still the following shortcomings: (1) The pain nursing is not highlighted. Routine nursing focuses on the prevention and treatment of complications, but includes few measures for pain intervention as the effects on patients who are not allowed to take analgesics are not satisfactory; (2) Off-hospital nursing is poorly effective. Routine nursing emphasizes in-hospital care and fails to follow up and intervene with patients on a long-term basis. As a result, the effects of nursing and recovery training after discharge are poor, leading to passively prolonged recovery time of joint functions [23]. In view of the above shortcomings of routine nursing, this study explored the effect of continuous nursing combined with salcatonin on the postoperative pain and joint function

improvement of elderly patients after hip replacement. The results showed that the RVAS, IVAS and PVAS scores of the SG at 7 d, 10 d, 14 d and 30 d after operation were significantly lower than those of the CG, suggesting that continuous nursing is effective in relieving postoperative pain of elderly patients with hip replacement. In this study, it is believed that the elderly patients with hip replacement are different from the young and middle-aged patients. The symptoms of osteoporosis are more obvious, and mechanical deformation of bone tissue causes compression on the peripheral nerves, which can lead to the increase of the load on peripheral muscle and induce pain, while salcatonin can reduce bone absorption by inhibiting the activity of osteoclasts and the transformation of monocytes to osteoclasts, so as to alleviate postoperative pain [24]. Therefore, continuous nursing was adopted for the SG patients to ensure the continuity of patient nursing. Even after discharge, patients can still have access to nursing services through telephone, WeChat, community medical institutions, etc. Continuous pain guidance can help patients go through the "painful periods" after operation and facilitate various recovery treatments and joint training. The HHS and Barthel Index scores of SG patients were significantly higher than those of CG at 1 month after operation, which also confirmed this standpoint, while the previous arguments were supported through intergroup comparison of GDS and establishing the positive role of continuous nursing in improving patients' negative emotions after operation.

At the end, the incidences of tumble and refracture at 6 months after operation were compared between the two groups. According to the results, the case numbers of tumble and refracture were 2 (4.00%) and 1 (2.00%) in the SG, and 8 (16.33%) and 6 (12.24%) in the CG ($P < 0.05$). These figures indicated that continuous nursing had good effects on reducing the incidence of adverse reactions. The reasons were that in the continuous nursing mode, patients' family members were actively involved and highly attentive, and the nursing was more elaborate.

In conclusion, the combination of continuous nursing and salcatonin can obviously relieve the pains in elderly patients after hip replace-

ment operation, improve their joint functions and reduce the incidences of tumble and refracture on a long-term basis. This method shall be popularized in clinic. However, this study has the following shortages: (1) Limited number of samples results in biased results; (2) Failure to develop long-term follow-up on patients. Against these problems, future studies based on larger sample size and longer follow-up time, and analysis of the impacts of drug intervention on patients' bone density are proposed with the expectation to develop a safer and effective postoperative recovery program for elderly patients after hip replacement, thereby establishing a theoretical basis for the improvement of postoperative QOL.

Disclosure of conflict of interest

None.

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