

Original Article

The effect of conservative therapy combined with rehabilitation nursing on elderly compression fracture patients

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Received May 27, 2020; Accepted September 29, 2020; Epub March 15, 2021; Published March 30, 2021

Abstract: Objective: To investigate the effect of rehabilitation nursing combined with conservative therapy on patients undergoing compression fracture surgery. Methods: 86 patients with compression fractures admitted to our hospital for rehabilitation from November 2018 to November 2019 were recruited as the study cohort. The patients were provided with conservative traditional Chinese medicine treatment along with rehabilitation methods such as rehabilitation nursing, lumbar pillows, and the prevention and cure of complications. The post-treatment effects and related influencing factors were observed. Results: A single-factor analysis showed the significant effect of the rehabilitation measures combined with the conservative treatment. Specifically, 80.23% of the patients positively responded to management with lumbar pillows, and the response rates of the other methods, including rehabilitation nursing, conservative TCM treatment, the prevention of complications, and the go-to-ground activity were 68.60%, 52.33%, 94.19%, and 73.26%, respectively. The response rates of the patients who did not undergo the combined treatment were 19.77%, 31.40%, 46.67%, 5.81%, and 26.74%, respectively. The differences were statistically significant ($P < 0.05$). Also, the overall response rate of the combination therapy was 69.76%. In addition, the logistic regression analysis indicated that lumbar pillows (OR = 0.488, $P = 0.036$), rehabilitation nursing (OR = 12.23, $P = 0.017$), conservative TCM treatment (OR = 1.023, $P = 0.533$), the prevention of complications (OR = 2.293, $P = 0.026$) and go-to-ground activity (OR = 2.311, $P = 0.021$) were independent factors in elderly compression fractures. Conclusion: Rehabilitation nursing combined with conservative treatment can shorten the healing period and improve functional recovery in elderly compression fracture patients.

Keywords: Conservative therapy, compression fractures, rehabilitation nursing

Introduction

Vertebral compression fractures are common in the middle-aged and aged population with weak constitutions and are mainly caused by falls or impacts, which will develop and seriously affect the patients with respect to their daily life both psychologically and physically if not treated in time. Efficient clinical treatment can improve patients' quality of life. Surgical treatment of compression fractures may cause adverse emotions and complications in patients, seriously hindering the patients' rehabilitation [1].

Elderly vertebral compression fracture mostly occurs in the thoracolumbar spine. The pa-

tients present with a compression of the anterior vertebral column due to a forward flexion injury, while the posterior vertebral arch remains normal, and the centrum is wedge-shaped. Such fractures are common in the thoracic and upper lumbar segments, and consultation about a patient's detailed injury history is important for the diagnosis [2]. Patients usually complain of back pain, or difficulty in moving, standing, or walking. In severe cases, the ligaments or spinous processes of the posterior vertebral arch are injured, resulting in protrusion and deformation, local swelling with ecchymosis that restricts spinal movement and causes compression or percussion pain [3]. Compression fractures rarely cause palsy due

to injured spinal cords and are mostly stable [4].

Considering the elderly patients' age and limited physical agility, compression fractures are mostly treated conservatively. However, the recovery is greatly dependent on the quality of care [5]. In this study, 86 elderly patients with compression fractures admitted to our hospital for rehabilitation were recruited as the study cohort to investigate the application and effect of conservative treatment combined with rehabilitation nursing on the compression fractures.

Materials and methods

Materials

A total of 86 patients with compression fractures admitted to our hospital for rehabilitation from November 2018 to November 2019 were recruited as the study cohort, including 47 males and 39 females aged 57-82 years old, with an average age of (64.5 ± 4.2) years. Among them, 31 cases experienced falls, 20 had car accidents, 27 slipped and were injured, and 6 were injured by falling objects. The patients had lower back pain along with local spinal compression or percussion pain and could only engage in limited activities. X-rays and CT scanning were used to diagnose osteoporosis and vertebral degenerative disease. The specific site of each fracture was from the 9th thoracic vertebra to the 5th lumbar vertebra. There were 59 patients with vertebral fractures only and 27 patients with multiple fractures.

Methods

Lumbar pillow: A pillow under the waist keeps the spine in hyperextension and helps replace the compressed centrum by making use of the strong myodynamia of the lower back muscles. The patients first were asked to lie flat on their backs on a hard bed. A multilayer, folded pillow was placed at 1-2 cm in front of the protrusion. Within 1 week, the height was increased 10-15 cm, and this was done for 4 weeks to keep the waist hyperextended before it was restored. This study was approved by the Ethics Committee of the Affiliated Hospital of Gansu University of Traditional Chinese Medicine. All the study participants provided a

written informed consent before participating in the study. Inclusion criteria: patients who met the diagnostic criteria for simple thoracolumbar compression fracture. Exclusion criteria: patients with fractures in other sites, and patients with heart disease or mental illness.

Functional recovery of movement: On the 3rd day after admission, dorsal stretch exercises were used. The patients were asked to support their bodies with their heads, elbows, and heels, and to do the exercises for two weeks. With their bodies supported by their heads and feet, their backs and buttocks were lifted away from the bed, and their necks were extended backwards as far as possible. This exercise was done for two weeks. In the 5th week, the patients were able to support their bodies with their hands and feet, such that their whole bodies looked like arch bridges. From the 6th week, in the prone position, their backs were extended backwards to lift their chests away from the bed. The pain caused by the thoracolumbar compression restricted the patients to bedrest and also affected their physiological functions and living abilities lasting possibly even to the end of the course of the disease. Some may be emotionally anxious and negative. Medical workers should communicate with them patiently and explain how the disease occurs, develops, and goes away in order to reduce their mental load, build their confidence, and invite positive cooperation. In the early stages of the treatment, a light diet was recommended, and more nutritious foods rich in protein, calcium, iron, and other trace elements were recommended for the middle stage while a tonic diet during the later period could promote bone healing and physical fitness. The food should be easy to digest, rich in nutrition, and appetizing. After 6-8 weeks of in-bed treatment, x-rays were performed to guide the patients to get on the ground, sit up, or stand under the supervision of professionals. On the ground, the patients needed to be well protected from spinal distortion due to their activity, and bending was strictly prohibited.

Rehabilitation nursing

Psychological nursing: Unbearable lower back pain caused by thoracolumbar compression forced the patients to stay in bed following their limited physiological functions and living skills, leaving the patients with great mental

suffering. During the longer course of disease, some patients were prone to anxiety and passive emotions. This required the medical workers to patiently communicate with them to explain the occurrence, development, and possible outcome of the disease, so as to relieve their mental burdens and enhance their confidence in the treatment. Also, a light diet was required during the early stages of the treatment. Until the middle stage, foods rich in protein and trace elements such as calcium and iron were increased, but in the later stages, a tonic diet was needed to promote bone healing and physical fitness. In general, the food should be easy to digest, rich in nutrition, and appetizing. After 6-8 weeks of treatment in bed, x-rays were performed to guide the patients to encourage them to attend go-to-ground activities, that is, the patients began to sit up under the guidance of the nurses. If there was no dizziness, the patient proceeded to stand on the floor for less than 10 min being well protected from spinal distortion due to the activity, and bending was strictly prohibited.

Oral traditional Chinese medicine: traditional Chinese decoctions, such as a decoction of four ingredients including peach kernels and safflower, were recommended to relieve pain and invigorate the circulation of blood in the early period. Drugs for pain relief and osteosynthesis were recommended in the middle stage, for example, an analgesic decoction for invigorating the blood circulation. Until the later period, decoctions for relaxing the tendons and activating the collaterals, including hematopoietic decoctions for aplasia, were used.

Prevent complications

(1) Constipation: The elderly patients had weakened digestive systems. Long-term bed rest leads to greatly reduced physical activity and positive moods, etc., leading to endocrine system dysfunction and easily causing constipation. In view of this, an increased amount of dietary fiber and informed ventral massages were given. (2) Bedsores: Poor physical fitness along with long-term bed rest easily causes bedsores. Massage at the site subject to compression helps protect the skin. The patients should change their body position every two hours by focusing on the apophyses such as the sacrococcygeal region, to which massage

and hot compresses should be applied if possible. (3) Hypostatic pneumonia: Long-term bed rest also led to lung infections for the patients remaining in the same position for a long period of time. Moving over and flipping on their backs regularly to motivate deep breathing and coughing were feasible to this end. For example, the aspiration of sputum was used for the patients with viscous sputum.

Outcome measures

Integrated with the complications and effective nursing, the overall response rates were expressed as: excellent: -no abdominal distension, regular bowel movements, and no abdominal pain, constipation, bedsores, or hypostatic pneumonia; effective: relieved abdominal pain and abdominal distension, mild constipation and bedsores, without hypostatic pneumonia; and ineffective: -aggravated conditions.

Statistical analysis

EpiData3.5 software was used to create the database we used in this study. SPSS 19.0 was used for the data analysis, which included univariate chi-square tests and multiple binary logistic regression analyses. χ^2 tests were used for the count data, and t tests were used for the measurement data. $P < 0.05$ indicated a statistically significant difference.

Results

The participants' response rates

Following the conservative treatment combined with the rehabilitation nursing interventions, the hospital stays of these patients were reported as 4-8 days, (5.68 ± 1.14) days on average. Among the 86 patients, the response rates were 27.90% (24/86) effective, 30.23% (26/86) ineffective, and 41.86% (36/86) excellent, suggesting that the combination treatment shortened the lengths of the hospital stays and improved the overall response rates of these patients, as shown in **Figure 1**.

X-ray examinations of a typical case at admission and at 3 weeks after the treatment

Female, 51 years old: L1 compression fracture; standard conservative treatment and athletic rehabilitation were given after admission. The

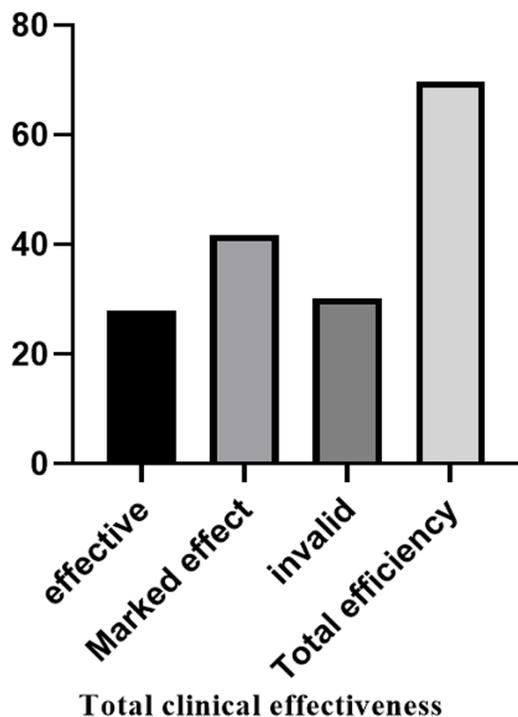


Figure 1. Overall response rate of the patients. An overall response rate of 69.76% (60/86) was reported from the 86 patients treated with rehabilitation nursing combined with conservative treatment. It proved the efficiency of such a combination on the recovery of the injured vertebral body.



Figure 2. Anterior vertebral compression. A 47% compressed anterior centrum with a Cobb angle of 18 degrees was recorded at admission.



Figure 3. The anterior vertebral compression after 3 weeks of treatment. After three weeks of treatment, the anterior centrum compression was reduced to 15% along with a reduced Cobb angle of 11 degrees. These values confirmed the excellent effect of the combined therapy in fractures.

x-ray examination showed that her vertebral compression and Cobb angles were reduced after 3 weeks of treatment compared with her condition at admission, as shown in **Figures 2 and 3.**

Single-factor analysis

The overall response rates of the pillow exercise, functional exercise, traditional Chinese medicine treatment, psychological care, diet care, go-to-ground activity, and prevention and cure of the complications were 80.23%, 68.60%, 52.33%, 72.09%, 86.05%, 73.26% and 94.19%, respectively, higher than the rates observed in the patients without such combination treatment: 19.77%, 31.40%, 47.67%, 27.91%, 13.95%, 26.74% and 5.81%, respectively ($P < 0.05$ for all). The related variable assignments are shown in **Tables 1, 2, and Figure 4.**

Multiple logistic regression analysis

The regression analysis revealed that the pillow exercise (OR = 0.488, $P = 0.036$), the

Table 1. Single factor analysis results [n (%)]

Variables	n	Used	Not used	χ^2	P
Pillow	86	69 (80.23)	17 (19.77)	5.773	0.029
Functional exercise	86	59 (68.60)	27 (31.40)		
Traditional Chinese medicine	86	45 (52.33)	41 (47.67)	4.162	0.031
Psychological nursing	86	62 (72.09)	24 (27.91)		
Diet care	86	74 (86.05)	12 (13.95)		
Go-to-ground activity	86	63 (73.26)	23 (26.74)	4.978	0.021
Prevention and cure of complications	86	81 (94.19)	5 (5.81)		

Table 2. Factors affecting therapeutic effect and the partial quantification

Factor	Variate	Quantized value
Pillow	X_1	= 1, if used; = 0, if not used
Functional exercise	X_2	= 1, if used; = 0, if not used
Traditional Chinese medicine	X_3	= 1, if used; = 0, if not used
Psychological nursing	X_4	= 1, if used; = 0, if not used
Diet care	X_5	= 1, if used; = 0, if not used
Go-to-ground activity	X_6	= 1, if used; = 0, if not used
Prevention and cure of complications	X_7	= 1, if used; = 0, if not used

regression equation, and the results were statistically significant, confirming that these specific risk factors were also independent factors affecting the recovery of elderly patients with vertebral compression fractures, as shown in **Table 3**.

Discussion

Compression fractures are often caused by trauma. The elderly are prone to fractures due to osteoporosis, especially compression fractures to which the most applicable method is conservative therapy [6, 7] as long as the lower limbs have not shown significantly reduced myodynamia or acroparalysis, regardless of the degree of compression of the vertebral body [8, 9]. In elderly patients, osteolysis precedes osteogenesis because of the lower calcitonin levels. Elevated osteolysis accelerates

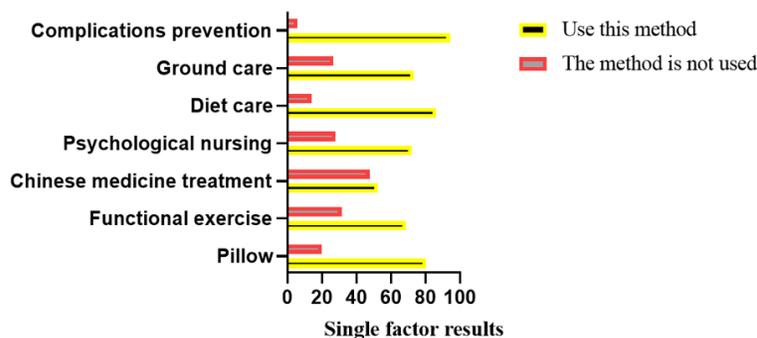


Figure 4. Single-factor analysis. Patients who received interventions of the pillow exercise, the functional exercise, the traditional Chinese medicine, the psychological nursing, diet care, go-to-ground activity, and the prevention and cure of complications reported significantly higher responses than those who did not use these methods ($P < 0.05$).

functional exercise (OR = 12.23, $P = 0.017$), the go-to-ground activity (OR = 2.311, $P = 0.021$), and the prevention and cure of complications (OR = 2.293, $P = 0.026$) were the principal risk factors affecting the expected curative effects on vertebral compression fractures in the elderly ($P < 0.01$ for all), and the protective factors included traditional Chinese medicine treatment (OR = 1.023, $P = 0.533$), psychological care (OR = 1.271, $P = 0.418$), and diet care (OR = 0.490, $P = 0.076$) ($P < 0.01$ for all). The above factors were incorporated into the

the dissolution of the bone matrix and the mineral concentrations to change the structure of the bone fibers, resulting in osteopsathyrosis and therefore fractures [10, 11]. In addition, patients with thoracolumbar fractures need to stay in bed for a long time. Decalcification due to disuse leads to bone loss, which aggravates the original osteolysis and prolongs bone healing [12, 13]. The combination of the necessary restoration, fixation, functional training, and rehabilitation nursing is one of the treatments for bone healing in fracture patients [14, 15].

Table 3. Multiple logistic regression analysis

Variables	Regression coefficient	Standard error	Wald χ^2	P	OR	95% CI
Pillow	-0.711	0.402	3.155	0.036	0.488	0.232-1.077
Functional exercise	2.501	0.986	6.533	0.017	12.23	1.772-3.715
Traditional Chinese medicine	0.022	0.039	0.387	0.533	1.023	0.953-1.105
Psychological nursing	0.240	0.295	0.657	0.418	1.271	0.712-2.261
Diet care	-0.713	0.401	3.150	0.076	0.490	0.232-1.074
Go-to-ground activity	0.795	0.354	5.291	0.021	2.311	1.372-3.960
Prevention and cure of complications	0.831	0.363	5.332	0.026	2.293	1.291-4.084

In this experiment, conservative treatments combined with rehabilitation nursing achieved good effects in patients with thoracolumbar fractures. For elderly patients with thoracolumbar compression fractures, it is of great significance to get enough bedrest and functional training at the early stages. These interventions provide the foundations for bone healing and the recovery of spinal stability [16-18]. Studies have found that the vertebral body is mostly composed of cancellous bone, and the reduction of vertebral body compression fractures is not achieved by the restoration of free bone blocks or the geometric filling of bone tissue, so it needs to be completed using external forces. Most patients can be treated conservatively, but the patients should rest in bed for about 3 months. In this regard, patients are likely to suffer from various complications during treatment, such as constipation, abdominal distension, and urinary tract infections, conditions that will affect the patients' rehabilitation and reduce their treatment compliance. Therefore, rehabilitation nursing is particularly important for the conservative treatment of thoracolumbar compression patients. In this study, the lumbar pillow exercise, functional exercise, the go-to-ground activity, and the prevention of complications were independent factors affecting the efficacy of the compression fractures. Functional exercises strengthened the tension of the anterior longitudinal ligaments and the intervertebral discs of the spine, reducing the probability of fibrosis in the soft tissues and any other tissues, and preventing the contracture of the lower back muscles, delaying spinal degeneration in the elderly [19-21]. The lumbar pillow exercise reinforced the myodynamia and stability of lower back muscles to stabilize the restored centrum [22, 23]. The go-to-ground activities plus

the prevention and cure of the complications improved the quality of life among the elderly [24, 25]. Studies have found that traditional Chinese medicine treatment does not affect the clinical effect in fact, which may be because of the patient's poor physical fitness, such that he or she is unable to tolerate drugs or limit the effect of drugs in the body.

In summary, although conservative treatment alone cannot restore the compressed centrum completely, conservative treatment combined with rehabilitation nursing can improve the myodynamia of the lower back muscles, achieve compensation, improve the quality of life, and shorten the period for fracture healing.

Disclosure of conflict of interest

None.

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