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The Relationship Between Low-energy Hip Fracture and the Knee Joint Degeneration

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Abstract

Background: Existing data have showed that there is obvious controversy of the knee joint as one of risk factors for hip fracture.

Objective: To observe the effect of knee joint degeneration on the low-energy hip fracture, as well as the mechanism.

Method: Prospective study was held among the hospitalized patients with minor traumatic femoral neck fracture or femoral intertrochanteric fracture from October 2017 to May 2018. The total number of the patients was 193 cases, 64 cases were male and 129 cases female; Onset age was (69.7±14.0) years old; all patients had pure hip fracture. All patients were taken conventional anterioposterior and lateral film of double hip and knee joints. All patients' clinical data were statistically analyzed, and the Kellgren and Lawrence classification criteria were used to classify the double knee joint. Finally, double knee joint was scored with HSS score and double hip joint WOMAC score.

Results and Conclusion: Among the 193 cases of fracture type, 121 cases were femoral neck fracture, 70 cases were femoral intertrochanteric fracture and 2 cases were femoral subtrochanteric fracture. KL classification of the knee joint: 0 level: 0 case; Ⅰ level: 26 cases; Ⅱ level: 102 cases; Ⅲ level: 65 cases; Ⅳ level: 0 case; according to KL classification, the average level of fracture side was (2.22±0.69), while uninjured side (1.55±0.55), and there was a significant difference on both sides ($P < 0.05$); knee joint HSS score: fracture side was (76.4±8.89) points, uninjured side was (78.8±8.51), and there was a significant difference on both sides ($P < 0.05$). Results suggested that the knee joint degeneration had a certain effect on the occurrence of hip fracture, like minor traumatic femoral neck fracture and femoral intertrochanteric fracture. Therefore, we drawed the conclusion that the knee joint degeneration could promote the occurrence of femoral neck and intertrochanteric fracture.

Keywords: Femoral Neck Fracture; HSS Score; Intertrochanteric Fracture; Knee Degeneration; Tissue Construction; WOMAC Score

Introduction

Hip fracture is a kind of senile disease, once the fracture occurs, it often generates serious complications, which can lead patients with severe cases to death. According to the report, by 2050, total number of patients with hip fracture will reach more than 6.26 million [1]. Moreover, it's been estimated that more than half of patients will concentrate mainly in Asian developing countries [2]. The treatment of hip fracture is given priority to conventional surgical treatment, thus early recovering weight loading and activity ability of lower limbs. As the growth of the age, organs function of the elderly will gradually decline, reductions of the secretion of hormone, resistance and immunity make it easier for the elderly to merge a variety of systemic diseases; coupled with elderly hip fracture patients being hit in certain degree during the treatment process, it is easy to produce a variety of complications. Hence with the growth of the age, the mortality of elderly hip fracture has been increased, the operation risk is extremely high, and there are more postoperative complications. Postoperative complications, such as the complication of central nervous system, which is characterized by anxiety, split personality, memory loss and mental disorder. What is more serious is that due to surgery and trauma hemorrhage, effective circulation reduces, the blood coagulability increases, electrolyte disorder emerges, thus causing cardiovascular and liver and kidney function damage. At the same time, the knee joint degeneration as well as hip and knee joint pain are common in in middle and elderly patients of all ages, the majority of patients after age 60 appear obvious symptoms of joint

pain, such as knee pain after walking, walking instability, stiff joints and even joint varus and valgus.

At present there are plenty of clinical researches about knee joint degeneration, epidemiological survey shows that more common risk factors such as high body mass index [3], history of heavy manual labor, moderate and severe osteoporosis, standing or sitting for a long time, all of above can lead to different degrees of joint activity obstacle and difficulty in walking. Among patients with severe hip and knee osteoarthritis, there exist passive bent-knees, varus or valgus changes of knee joint, and secondary anterior pelvic tilts [4-6], if pelvic tilt angle increases, acetabulum contain reduces and femoral bone substance changes, secondary hip arthritis may lead to the occurrence of fracture. Besides the bone degradation of the elderly, combined with the decrease of the ability to respond, the drop of hip muscles toughness, protective effect will become worse and slight damage can lead to hip fracture of the elderly, therefore there is a high incidence of hip fracture among older adults, and the incidence increases with age. However, whether the knee joint degeneration can cause the occurrence of hip fracture, related experiments and literature research lack very much. So to clarify the correlation between the two and further explore the incidence and mechanism of joint fracture, a prospective study was held in the First Affiliated Hospital of Nanchang University, we investigated knee joint degeneration records of hospitalized patients with hip fracture, and wanted to find if there was a correlation between the two.

Subjects and Methods

Design

Prospective study.

Time and Site

The test was completed in the First Affiliated Hospital of Nanchang University from October 2017 to May 2018.

Object

We choose hospitalized patients with traumatic hip fracture of the same period in the First Affiliated Hospital of Nanchang University. Diagnostic criteria: according to clinical symptoms, signs and imaging, patients were diagnosed with femoral neck fracture, femoral intertrochanteric fracture or the femoral subtrochanteric fracture.

Inclusion criteria: (1) injury mechanism was low violent traumatic patients, which referred to fracture caused by a variety of mild violent injury, such as walking hurt, slip, sprain, falling steps hurt, falling hurt or sprain during mild activities, etc. (2) the unilateral fracture. (3) the age standard was 30 or above. (4) patients agreed and signed the informed consent Exclusion criteria: multiple fracture, pathological fracture, infectious fracture, chronic fracture or merging serious organ disorders. Elimination criteria: if the patients elected to the clinical research belonged to one of the following cases, he or she would be eliminated. (1) did not meet the inclusion criteria, or meet the exclusion criteria. (2) medical record was not complete. In this study 193 cases were included, 64 cases were male and 129 cases female, onset age was 34-95 years old and average (69.7±14.0) years old. On admission, hip fracture types were as follows: 121 cases were femoral neck fracture ,70 cases were femoral intertrochanteric fracture and 2 cases were femoral subtrochanteric fracture. 90 cases were the fracture on the left side and 103 cases on the right side.

Method

Data collection: all the patients had been told about experimental process of this study and its related matters needing attention, and signed patients' informed consent. Among all patients, necessary imaging examinations were carried, including anterioposterior and lateral film of double hip and knee joints. We assessed double knee joint of all the patients by KL classification, according to the literature [7-8] reports had rated the grade from level 0 to level IV. Due to the need of surgery, 3D reconstruction was added to carry among some patients to clear the type and degree of fracture. All the patients' basic information was complete and assessed by WOMAC score. WOMAC rating scale could evaluate the structure and function of hip and knee joint on pain, stiffness and joint function these three aspects with 24 total items, which contained the basic signs and symptoms of the osteoarthritis [9]. At present, American Hospital for Special Surgery (HSS) score system is the "gold standard" of knee joint function assessment at home and abroad, the evaluation contents include knee joint function, HSS score, strength and stability of the knee joint, knee joint pain, etc. [10].

Main Observation Indexes

(1) comparison between fracture number and gender. (2) distribution of fracture patients' age. (3) distribution of fracture type. (4) influence of the knee joint degeneration on the incidence of hip fracture. (5) complications.

Statistical Analysis

We used SPSS 19.0 software for data statistics processing, the group t test and chi-square test were used to identify fracture side and the contralateral side. There were no differences between WOMAC score and HSS score, both fracture type and joint function score index were correlatively analysed. $P<0.05$ means that there is a significant difference.

Results

Participants Quantitative Analysis

According to the intention, we dealed with scores, and all 193 cases of patients were under the result analysis.

Comparison Between Fracture Number and Gender

This group of cases was unilateral fracture. Fracture type: 121 cases were femoral neck fracture with 37 cases male, 84 cases female; 70 cases were femoral intertrochanteric fracture with 25 cases male, 45 cases female; 2 cases were femoral subtrochanteric fracture with all cases male. Gender distribution in these three types

of fracture presented no significant differences (chi-square=0.35, P>0.05). The ratio of limbs fracture on the left and right side was 0.8:1.

Distribution of Fracture Patients' Age

The total number of patients was 193, their mean onset age was (69.7±14.0) years old. Among them, 6 cases were 34-40 years old, 17 cases were 41-50 years old, 28 cases were 51-60 years old, 30 cases were 61-70 years old, 65 cases were 71-80 years old, 41 cases were 81-90 years old, 6 cases were over the age of 90 years old. Femoral intertrochanteric fracture patients age was 40-95 years old (71.9±13.5); femoral neck fracture patients age was 34-93 years old (68.3±14.2). There was no significant difference between the age of patients with femoral neck fracture and the age of patients with femoral intertrochanteric fracture (P>0.05).

Distribution of Fracture Type

A total of 121 cases were femoral neck fracture, 70 cases were femoral intertrochanteric fracture, 2 cases were femoral subtrochanteric fracture. Proportion of fracture type distribution showed the femoral neck fracture accounted for 62.7% and femoral intertrochanteric fracture 36.3%.

Influence of The Knee Joint Degeneration on The Occurrence of Hip Fracture

In this study, a total of 193 cases were the patients with unilateral hip fracture. Classification results of the knee joint degeneration were as follows: 0 level: 0 cases I level: 26 cases; Ⅱ level: 102 cases; Ⅲ level: 65 cases; Ⅳ level: 0 cases. Mild and moderate degeneration proportion was 66.3%, moderate and severe degeneration proportion was 33.7% (Table 1) (Figures 1,2).

Grading	Fractured side	Non-fractured side
Level 0	0	0
Level I	29	93
Level II	93	100
Level III	71	0
Level IV	0	0
Total	193	193

Table 1: Comparison of Kellgren-Lawrence grading in fractured and non-fractured side.

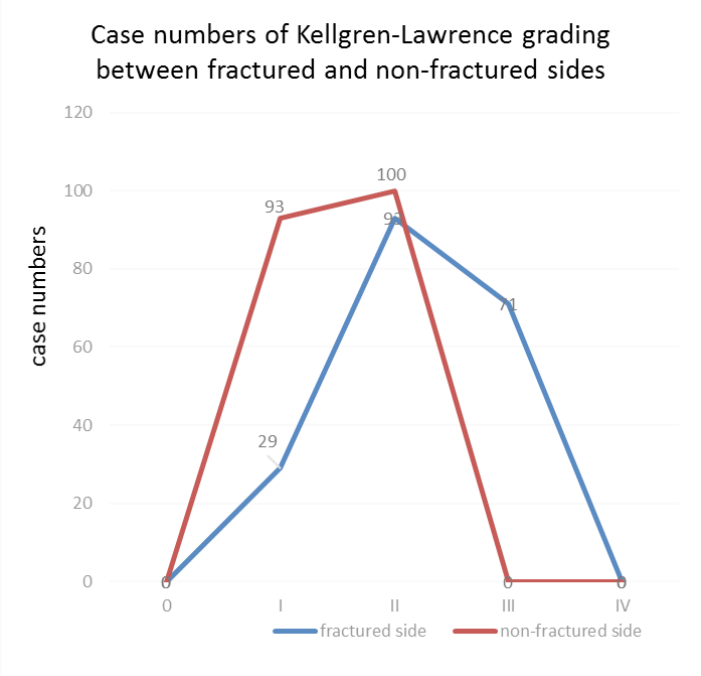

Figure 1: Case Numbers of Kellgren-Lawrence grading between fractured and non-fractured sides.

Figure 2: X-ray films of patients with knee osteoarthritis suffering from hip fractures. A was the patient's hip joint plain film, showed the right hip fracture; B was the patient's knee joint plain film, showed KL grade II.

Fracture side and the contralateral side knee were evaluated by KL classification, respectively: KL grade of fracture side was

(2.22±0.69), KL grade of the contralateral side was (1.55±0.55), and chi-square test analysis showed that chi square was 13.4, thus existing a significant difference (P<0.05). KL grade of fracture on the left side was (2.19±0.63), KL grade of fracture on the right side was (2.19±0.73), statistical tests showed there was no significant difference (P>0.05). KL score indicated that hip fracture side could present high performance of knee joint osteoarthritis. Knee joint WOMAC score: on admission, WOMAC score of knee joint on fracture side was 29.6±15.5, WOMAC score of knee joint on the contralateral side was 37.0±18.2, chi-square test analysis showed that chi square was 4.59, thus existing a significant difference (P<0.05). WOMAC score of the left lateral fracture was 29.4±16.1, WOMAC score of the right lateral fracture was 29.7±15.1, chi-square test analysis showed that there was no significant difference (P>0.05).

Knee joint HSS score: on admission, HSS score of knee joint on fracture side was 50-92 (76.4±8.89), HSS score of knee joint on the contralateral side was 50-94 (78.8±8.51), chi-square test analysis showed that chi-square was 51.98, thus existing a significant difference (P<0.05). HSS score of the left lateral fracture was 50-92 (79.5±8.97), HSS score of the right lateral fracture was 50-93 (79.2±8.3). Chi-square test analysis showed that chi-square was 0.45, thus existing no significant difference (P>0.05). Results suggested that the severe side of knee joint degeneration would increase the possibility of hip fracture (Table 2) (Figure 2).

HSS score	Fractured side	Non-fractured side
50-59	11/9.4	10/8.5
60-69	25/21.6	11/9.4
70-79	80/69	68/58.7
80-89	69/59.5	91/78.6
90-100	8/6.9	13/11.2
Total	193/166	193/166
Form comment: Comparison of HSS scores of bilateral knee joints (χ^2=71.4，$P < 0.05$)		

Table 2: Scores on Hospital for Special Surgery in fractured and non-fractured sides.

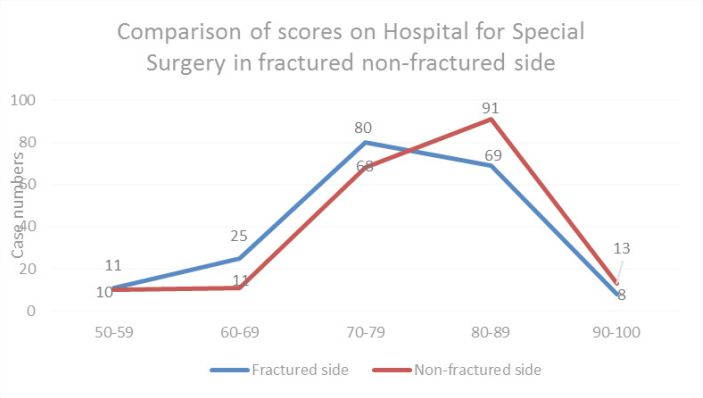

Figure 3: Comparison of scores on Hospital for Special Surgery in fractured and non-fractured sides.

Correlation Analysis Between Hip Fracture and Knee Joint Degeneration

Pearson correlation analysis show that hip fracture is positively and weakly correlated with knee joint degeneration. (Table 3).

		HSS score	WOMAC score	KL score
Hip fracture	person	-0.335	-0.290	0.320
	P	0.009	0.000	0.001

Table 3: Correlation analysis between hip fracture and knee joint degeneration.

Complications

After admission and during hospitalization, we carried out the related complication statistics. In total, mergering cardiovascular system diseases were 90 cases, respiratory system diseases were 43 cases, endocrine system diseases were 60 cases, digestive system diseases were 6 cases. Among these patients, some of them had more than one complication and this kind of patients were 70 cases in total.

Discussion

Elderly patients with hip fracture is quite common, many literatures have studied pathogenic risk factors and treatment in elderly patients. At the same time, the knee degenerative change is also a common joint disease in elderly patients, the majority of the middle-aged and old patients have obvious knee osteoarthritis symptoms, severe cases have lower limb disability [11]. For patients with serious joint degeneration and deformity, most of them require hospitalization and knee replacement, such patients usually have difficulties in walking, need to be on crutches or even brake, so their activity is very low, generally have low hip fracture probability [12]. For the majority of patients with mild and moderate knee joint degeneration, joint pain and joint activity limitation is tolerable, most patients still have normal activities and maintain a certain amount of sports activities, so among this kind of people, it is likely to have low traumatic injuries resulting in hip fracture. And this study also has found that many trauma patients have fractures due to slip or sprain when walking on the ground or during exercise such as jogging, etc.

Among the researches on hip osteoarthritis and knee joint osteoarthritis [13-15], several studies have pointed out that because of the effect of osteoarthritis, the lines of force have changed [13], resulting in knee flexion deformity and hip anteversion change, severe cases are complicated with the change of curvature of the lumbar spine. Therefore, muscle strength of lower limb changes, unbalanced stress could lead to unstable joint forces, which is prone to injury of hip fracture. For the present clinical studies of relationship between knee joint and hip fracture, there exist many different versions, part of the studies points out that except for factors of muscle strength of lower limb, bone condition of the joint itself is also one reason [16]. In many epidemiological studies, osteoporosis has been considered one of the clear risk factors of

hip and knee joint lesions [17,18]. However, until now the problem that how knee joint disorder leads to difficulty of hip function, the change process of muscle strength of lower limb, osteoporosis and the angle of anterior pelvic tilt, as well as the analysis of comprehensive factors, in all above aspects there still exist debates [19-23], and lacks clear research methods. Whether trauma causes joint dysfunction, or the change of power line structure of lower limb could lead to the imbalance of power line, there still is no clear conclusion.

Among biomechanics studies of hip and knee joint, many hypotheses have been put forward. Some scholars suppose that secondary hip and knee degeneration is caused by lumbar degeneration [24,25], leading to a series of corresponding characteristic changes, such as aggravation of lumbar lordosis, increase of sacral slope angle and anterior pelvic tilt. While waist and knee degeneration caused by primary hip diseases will lead to reduction of lumbar lordosis [26], decrease of sacral slope angle and posterior pelvic tilt. In addition, among patients with the hip disease caused by congenital dysplasia [27], such as congenital hip dysplasia, epiphyseal slippage of the femoral head, etc., compensatory anterior pelvic tilt gradually appears with their growth, and in the end stage of osteoarthritis, false mortar forms, and femoral head is in a state of subluxation or complete dislocation, then femoral head shifts from true mortar to false mortar of acetabulum, thus leading to the deterioration of the lower limb joints contracture, double lower limbs length discrepancy, as well as the performance of knee flexion and unbend barrier. As a result, the patients' daily activities are limited, and they have obvious joint activities obstacles.

At present, there are increasing number of researches on risk factors for pathogenesis of hip and knee osteoarthritis, recognized risk factors include age, body mass index, lifestyle, diet, accommodation and osteoporosis, even injury types have also been studied. Now it is generally believed that abnormal body mass index and osteoporosis are significant risk factors for hip and knee osteoarthritis in elderly patients [28]. At the same time, this group of investigation has showed that patients with too large body mass index have much more serious knee joint degeneration, but whether the phenomenon has a clear correlation with genesis and development of hip fracture, this study temporarily is unable to make a conclusion, it may be related to data limitation and regional difference. The experiment need to be proved by the late last survey of related risk factors analysis and the analysis of the cases of large data. In this study, lacking standard diagnosis and treatment of bone mineral density and unable to entirely clarify osteoporosis degree are the pities of this experiment. In addition, this study has also carried out short-term studies on the treatment of knee osteoarthritis, some patients do have remission of symptoms, which also proves that early positive intervention therapy of the knee joint degeneration can relieve symptoms, appropriately reduce the probability of hip fracture.

The characteristic of the test is in the hospital clinical cases purposely analyzing the related risk factors of hip fracture (femoral neck fracture, femoral intertrochanteric fracture) for patients with knee joint degeneration. For the correlation between knee joint degeneration and occurrence of hip fracture, this study has put forward the positively and weakly correlation between the two, thus providing a certain basis of clinical early intervention ot treat knee joint degeneration. After evaluating KL classification of fracture side and the contralateral side of knee joint, respectively, we find that there is a significant difference between KL score of fracture side and KL score of the contralateral side, while there is no significant difference in KL classification between the left side of the fracture and the right side of the fracture. KL score indicates that hip fracture side could present high performance of knee joint osteoarthritis. On admission, there is a significant difference in WOMAC score between fracture side and the contralateral side of knee joint, while there is no significant difference in WOMAC score between the left side of the fracture and the right side of the fracture. On admission, there is a significant difference in HSS score between fracture side and the contralateral side of knee joint, while there is no significant difference in HSS score between the left side of the fracture and the right side of the fracture. Results suggest that the knee joint degeneration side could increase the possibility of hip fracture. At the same time, this research also has a certain of defects. First one is that in this case investigation, the amount of data is relatively limited, and temporarily there is no case-control study, so we cannot avoid the problem of sample selective bias. Second one is that this test is lack of clear osteoporosis inspection report, making the diagnosis of mild and moderate osteoporosis unconfirmed. Final one is that this experiment is lack of severe knee joint degeneration patients, which will cause a certain interference in the data analysis of relevant factors, and it need to be further enriched with the late experimental data to be gradually corrected.

Now clinical diagnosis and treatment of hip fracture have been reported many times, but researches on relations with knee joint degeneration and lumbar degeneration, as well as joint itself changes are relatively rare. This experimental investigation to some extent indicates there could exist a correlation between knee joint degeneration and hip fracture, also provides a certain reference for clinical diagnosis and treatment services. And early intervention treatment of knee joint degeneration has the characteristic of slowing down the disease development. This study need late cases of large sample and multicenter studies to be drawed a further conclusion, thus providing a certain reference for the clinical diagnosis and treatment.

Conclusion

Knee degenerative change has a certain effect on some types of hip fracture, such as femoral neck fracture and femoral intertrochanteric fracture, and it is an independent risk factor for low traumatic hip fracture. Early focusing on the progression of knee joint osteoarthritis and initiating targeted therapy could play an important role in slowing down the development of hip fracture.

Author Contributions

The first author and corresponding author conceive and design experiment, the first author and the second author carry out experiment and collect and analyze the data, the first author, the second author, the third author and the fourth author commonly have blinded assessment, the corresponding author is the reviser, the first author is responsible for the article.

Conflicts of Interest

All authors jointly approved that this article involves no relevant conflict of interest.

Ethical Problem

Individuals taking part in this experiment were voluntary, all patients were fully informed about the testing process.

Academic Terms

biomechanics concept of the knee joint? Knee joint load could change a lot with the human body movement and gait, static stress distribution of knee joint when standing (feet on the ground) is 0.43 times of the weight, while walking it could be up to 3.02 times of the weight, and it can reach 4.25 times when climbing up the stairs. Normal transmission of the knee force is by means of creepage between the meniscus and articular cartilage to increase the contact area, thus reducing the load to the force per unit area. In the coronal plane, when one foot on the floor, the gravity of the human body along the vertical center line and passes through the inside of the knee joint. The gravity makes femur lean to tibial medial condyle. At this point, the broad tensor fascia and glutes through the iliotibial band maintain a balance by the lateral force, the sum of these forces represents the overall support of the knee joint on the surface, the resultant force is through the center of the knee joint.

Complex Knee Pain

local and other parts of the outside of the knee joint lesions are the common causes of knee pain.

Statement

The first author of this article is responsible for the misconduct during the research and writing process. The original image, data (including computer database), records and samples involved in this paper have been saved, shared, and destructed in accordance with the relevant regulations, and are acceptable for verification.

References

1. Cooper C, Campion G, Melton LJ (1992) 3rd Hip fractures in the elderly: A world-wide projection. Osteoporos Int 2: 285-289.
2. Hu R, Jiang XY, Wu XN, et al. (2005) Validation research on Chinese edition of osteoporosis self-efficacy scale. Nursing F Med Sci 24: 696-698.
3. Dhanwal DK, Dennison EM, Harvey NC, Cooper C (2011) Epidemiology of hip fracture: Worldwide geographic variation. Indian Journal of Orthopaedics 45: 15-22.
4. Shangke Qu (2014) Correlation between knee osteoarthritis and hip degeneration. Yunnan College of Traditional Chinese Medicine 2014.
5. Redmond JM, Gupta A, Hammarstedt JE, Stake CE, Domb BG, et al. (2014) The Hip-Spine Syndrome: How Does Back Pain Impact the Indications and Outcomes of Hip Arthroscopy? Arthroscopy 30: 872-881.
6. Bechara BP, Agarwal V, Boardman J, Perera S, Weiner DK, et al. (2014) Correlation of Pain with Objective Quantification of Magnetic Resonance Images in Older Adults with Chronic Low Back Pain. Spine 39: 469-475.
7. Kellgren JH, Lawrence JS (2012) Radiological assessment of osteo-arthrosis. Ann Rheum Dis 16: 494-502.
8. Chudyk AM, Ashe MC, Gorman E, Al Tunaiji HO, Crossley KM (2012) Risk of hip fracture with hip or knee osteoarthritis: a systematic review. Clin Rheumatol 31: 749-757.
9. Bellamy N, Buchanan WW, Goldsmith CH, Campbell J, Stitt LW (1988) Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. J Rheumatol 15: 1833-1840.
10. Houshan Lv (2012) Artificial joint surgery. Beijing: Science and Technology Press 347.
11. Lalmohamed A, Opdam F, Arden NK, Prieto-Alhambra D, van Staa TV, et al. (2012) Knee arthroplasty and risk of hip fracture: a population-based, case-control study. Calcif Tissue Int 90: 144-150.
12. Prieto-Alhambra D, Javaid MK, Maskell J, Judge A, Nevitt M, et al. (2011) Changes in hip fracture rate before and after total knee replacement due to osteoarthritis: a population-based cohort study. Ann Rheum Dis 70: 134-138.
13. Jianxiong Wang, Mouwang Zhou, Ping Gong, et al. (2014) Isokinetic strength of knee flexors and extensors in patients with knee osteoarthritis and its correlation with function. Chinese rehabilitation theory and practice 4: 1105-1108.
14. Dexin Li (2012) Analysis of the relationship between hip fracture and knee osteoarthritis in the elderly, Jilin Province, Jilin University 2012.
15. Metcalfe AJ, Stewart C, Postans N, Dodds AL, Holt CA, et al. (2013) The effect of osteoarthritis of the knee on the biomechanics of other joints in the lower limbs. Bone Joint J 95: 348-353.
16. Pagès-Castellà A, Prieto Alhambra D (2013) Prieto, Degenerative osteoarthritis, osteoporosis and fractures: controversies and evidences. Med Clin (Barc) 141: 217-220.
17. Qiang Li, Huiyin Ren (2014) Correlation between bone strength and bone mineral density in elderly patients with knee osteoarthritis. Chinese Journal of Gerontology 11: 1837-1839.
18. Makridis KG, Karachalios T, Kontogeorgakos VA, Badras LS, Malizos KN (2015) The effect of osteoporotic treatment on the functional outcome, re-fracture rate, quality of life and mortality in patients with hip fractures: A prospective functional and clinical outcome study on 520 patients. Injury 46: 378-383.
19. Offierski CM, MacNab I (1983) Hip-spine syndrome. Spine 8: 316-321.
20. Yoshimoto H, Sato S, Masuda T, Kanno T, Shundo M, et al. (2005) Spinopelvic alignment in patients with osteoarthrosis of the hip. Spine 30: 1650-1657.

21. Guosheng Zhang (2013) Correlation between knee flexion deformity and sagittal alignment of lumbar spine and pelvis[J]Chinese Journal of Orthopaedics 21: 914-917.

22. Hui Liu, Shrivastava SR, Zheng ZM, Wang JR, Yang H, et al. (2013) Correlation between lumbar disc degeneration and spinal-pelvic sagittal balance. Chinese Medical Journal 93: 1123-1128.

23. Zhaojian Zheng (2013) Relationship between recurrence of lumbar disc herniation and lumbar curvature. Chinese medicine bone 25: 24-26.

24. Zhiwei Jia, Chao Zhang, Dike Ruan (2012) Advances in the relationship between high signal area of lumbar intervertebral disc and low back pain. Chinese Journal of Bone and Joint 1: 543-546.

25. Haiying Liu (2002) Treatment of lumbar degenerative diseases combined with articular degeneration of lower extremity. Chinese Journal of Orthopaedics 22: 531-534.

26. Hai Chen (2010) Preliminary study on the role of small and small joint-derived inflammatory factors in degenerative lumbar spinal stenosis. Chinese Journal of Orthopaedics 12: 543-547.

27. Zhiqi Zhang (2013) The role of sagittal anatomical parameters of human pelvis in hip replacement[J]. Chinese Medical Journal 93: 1190-1191.

28. Barrey C, Roussouly P, Perrin G, Le Huec JC (2011) Sagittal balance disorders in severe degenerative spine□Can we identify the compensatory mechanisms?. Eur SPine J 20: 626-633.