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Effect of genu varum and genu valgum on lower limb alignment after total knee arthroplasty.

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Abstract

Aim: To investigate the effect of genu varum and genu valgum on lower limb alignment after total knee arthroplasty.
Methods: From February 2016 to February 2017, a total of 57 patients with genu varum and genu valgum who received total knee arthroplasty were selected to conduct a retrospective analysis. The recovery of lower limb alignment was compared in the patients and the improvement state before and after operation was evaluated by Harris scores and Barthel index scores.
Results: There was a significant difference between the two groups in the lower limb alignment before and after treatment. Before treatment, the Harris score and Barthel index score of patients were significantly lower than those after treatment and the comparison of data between before and after treatment was statistically significant.
Conclusion: The total knee arthroplasty in patients with genu varum and genu valgum can significantly improve the lower limb alignment, enhance the patient's joint activities and promote the quality of life. Thus, it should be recommended to be popularized and applied in clinical treatment.

Keywords: Genu varum, Genu valgum, Total knee arthroplasty, Lower limb alignment.

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Introduction

Genu varum and genu valgum is a specific representation of many diseases with it pathogenesis manifested in internal diseases and surgical diseases. It has a great impact on the patient's ability to live independently and the function of the knee joint [1]. It is of some difficulty for surgeons to conduct an operation and remains a surgical clinical problem of moderately large challenge. Genu varum will cause the lateral structure to be relatively weak and it is difficult to improve the stability of patients' knee joint by conventional correction method [2,3]. Total Knee Arthroplasty (TKA) is a new treatment mode which can effectively improve the quality of life of patients. In this study, a retrospective analysis on the data of 57 patients treated by Total Knee Arthroplasty (TKA) in our hospital from February 2016 to February 2017 was conducted to study the value of TKA in the patients with genu varum and genu valgum in combination with clinical practices and researches as follows.

Material and Methods

General data

From February 2016 to February 2017, a total of 57 patients with genu varum and genu valgum who received total knee arthroplasty were selected to conduct a retrospective analysis. There were 30 males and 27 females aged 43-72 with the average age of 61.02 ± 4.12. Clinical diagnosis result showed there was knee osteoarthritis in 52 cases, rheumatoid arthritis in 4 cases and traumatic arthritis in 2 cases.

Methods

The center of knee was incised with general anesthesia and intramedullary location mode was applied in thighbone. The osteotomy plate of appropriate type was adopted to conduct the osteotomy on four sides with intramedullary fixation applied to tibial osteotomy. The osteotomy is perpendicular to the tibial mechanical axis. Then trial of a mold prothesis was set up with the balance of soft tissue. Stable femoral and tibial prostheses were selected based on the type of trial model followed by impulse wash of osteotomy plane, placement of bone cement, installation of prosthesis, placement of drainage tube and closure of the incision.

Evaluation criteria

The postoperative recovery of lower limb alignment was compared in the patients, before and after surgery, the PHILPS BACKY DIAGNOST type 500 mA X-ray machine was applied to shoot full length weight-bearing X-ray film of both lower limbs, which was analysed and the lower limb alignment was measured by the medical image analysis software-Digimizer V3.7.1.0. During the measurement, femoral head center, position of knee joint and knee joint center were specifically located. The items of Harris score mainly included function, pain, deformity, and Range of Motion (ROM) of joints. The score ranged from 0 to 100. The higher the score, the better the recovery [4]. Barthel index Basel Index (referred to as BI) was used to compare the patient's ability to live independently before and after treatment.

Statistical methods

The SPSS 20.0 software was used to analyse data. The measurement data were described as mean ± standard deviation and checked by t test. $P<0.05$ suggests that the difference is statistically significant.

Results

Comparison of patients' lower limb alignment between before treatment and after treatment

There was a significant difference of statistical value in lower limb alignment between the two groups before and after treatment (Table 1).

Table 1. *Comparison of patients' lower limb alignment between before treatment and after treatment.*

Index	Before treatment	After treatment	χ^2	p
HKA	7.29 ± 2.05	2.21 ± 1.67	6.38	0.037
HPVA	7.04 ± 2.57	6.72 ± 1.79	5.76	0.029
MPTA	87.61 ± 12.23	90.87 ± 5.41	6.92	0.023
LMAL1	741.27 ± 36.75	757.87 ± 45.03	7.25	0.031
LMAL2	749.08 ± 35.67	758.92 ± 44.76	7.14	0.046

Comparison of Harris function score between before treatment and after treatment

The Harris scores after treatment was significantly higher than that before treatment of statistical value (Table 2).

Table 2. *Comparison of Harris function score between before treatment and after treatment. Note: *The difference in Harris function scores between before operation and 6 months after operation was significant.*

Condition	Score
Before operation	14.74 ± 3.17*
3 months after operation	33.54 ± 2.45
6 months after operation	68.34 ± 2.65*
t	9.02
p	0.007

Comparison of Barthel index between before treatment and after treatment

The Barthel index score after treatment was significantly higher than that before treatment of statistical value (Table 3).

Table 3. *Comparison of Barthel index between before treatment and after treatment.*

Condition	BI total score	Taking food	Going to the toilet	Bed and chair transfer	Level walking
Before treatment	5.23 ± 3.23	1.56 ± 1.65	0.31 ± 0.12	0.56 ± 1.25	0.25 ± 0.06
After treatment	7.83 ± 4.87	8.62 ± 2.37	8.76 ± 2.23	11.43 ± 3.65	15.27 ± 0.24
t	11.27	7.37	7.53	8.54	8.65
p	0.021	0.010	0.007	0.005	0.001

Discussion

Total Knee Arthroplasty (TKA) can effectively alleviate the pain of patients with knee joint lesions, improve the knee function and restore their normal life with moderately ideal treatment effect in clinical practices [5,6]. In surgical treatment, genu varum and genu valgum will affect the recovery of lower limb alignment in the patients after being treated by TKA, so it is necessary to strengthen the effect on the strength of lower extremity of genu varum and genu valgum in patients with total knee arthroplasty.

Good lower limb alignment is realized mainly through the accurate osteotomy of distal femur and proximal tibia with reasonable adjustment of soft tissue balance in TKA [7,8]. In clinical treatment, the distal femur osteotomy is often performed by intramedullary fixation. The valgus angle of the osteotomy is defined in combination with area of KPVA with the fixation value ranging from 5º to 6º [9-12]. The regression relations between preoperative HKA (hip knee ankle angle) and KPVA will directly affect overall effect of treatment, so it is needed to appropriately increase the valgus angle of osteotomy of distal femur in patients with serious genu varum so as to improve the accuracy of postoperative limb alignment [13-15].

According to the clinical research results, there was obvious difference in the patients' limb alignment between before treatment and after treatment, demonstrating the application value of total knee arthroplasty in effective improvement of limb alignment level. At the same time, the Harris score and Barthel index score before the treatment were significantly lower than those after treatment of statistical significance,

proving that total knee arthroplasty has obvious effect in treatment of genu varum and genu valgum with its function to significantly improve the patient's capability of living independently. As a result, it has high application value in clinical trials.

To sum up, in the patients with genu varum and genu valgum, the total knee arthroplasty enables to significantly improve lower limb alignment, enhance the joint activities and enhance the quality of life. Therefore, it is advised to be widely used in clinical treatment.

References

1. Sorrells RB, Murphy JA, Sheridan KC. The effect of varus and valgus deformity on results of cementless mobile bearing TKA. Knee 2007; 14: 284-288.
2. Zhao M, Tian H, Zeng L. Measurement and analysis of coronal line of tibial prosthesis after tibial osteotomy with tibial tuberosity and anterior tibial tendon localization in Chinese. J Peking Univ 2016; 48: 351-355.
3. Wu B, Wang Y, Zhang G. Effect of two femoral osteotomy angles on coronal alignment of femoral prosthesis during knee replacement. Chinese J Orthop Surg 2017; 25: 838-843.
4. Ma L, Guo W, Ma J, Yue D. Does the valgus osteotomy affect the lower limb force line in total knee arthroplasty? Chinese J Tissue Eng Res 2017; 21: 1658-1663.
5. Li G, Han G, Zhang J. Application of tibial mechanical axis positioner in total knee replacement with deformity of tibial joint. Chinese J Repar Reconstr Surg 2013; 27: 847-850.
6. Gao F, Ma J, Sun W. The influence of knee malalignment on the ankle alignment in varus and valgus gonarthrosis based on radiographic measurement. Eur J Radiol 2016; 85: 228-232.
7. Moon YW, Kim JG, Han JH. Factors correlated with the reducibility of varus deformity in knee osteoarthritis: an analysis using navigation guided TKA. Clin Orthop Surg 2013; 5: 36-43.
8. Stucinskas J, Robertsson O, Sirka A. Moderate varus/valgus malalignment after total knee arthroplasty has little effect on knee function or muscle strength: 91 patients assessed after 1 year. Acta Orthop 2015; 86: 728-733.
9. Zhang J, Xiao L, Hao Z. Kinematic and kinetic analysis of lower limb before and after total knee arthroplasty (TKA) in a Chinese population. Int Congr Imag Sig Proc Biomed Eng Inform IEEE 2017; 1701-1706.
10. Ozler K, Aktas E, Cigdem Atay. Serum and knee synovial fluid matrixmetalloproteinase-13 and tumor necrosis factor-alpha levels in patients with late stage osteoarthritis. Acta Orthopaedica Et Traumatologica Turcica 2016; 50: 670-673.
11. Gapeyeva H, Buht N, Peterson K. Quadriceps femoris muscle voluntary isometric force production and relaxation characteristics before and 6 months after unilateral total knee arthroplasty in women. Knee Surg Sports Traumatol Arthrosc 2007; 15: 202-211.
12. Judd DL, Eckhoff DG, Stevenslapsley JE. Muscle strength loss in the lower limb after total knee arthroplasty. Am J Phys Med Rehabil 2012; 91: 220-226.
13. Yoo JH, Park SH, Han CD. Radiologic outcomes according to varus deformity in minimally invasive surgery total knee arthroplasty. Yonsei Med J 2016; 57: 225-231.
14. Rodriguez JA, Bas MA, Orishimo KF. Differential effect of total knee arthroplasty on valgus and varus knee biomechanics during gait. J Arthroplast 2016; 31: 248-253.
15. Taylor DW, Bohm KC. Distal femoral varus osteotomy for valgus deformity of the knee as a surgical alternative to total knee arthroplasty: a case study. Univ Toronto Med J 2008; 12: 99-101.

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