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The Study of Lower Extremity Alignment Correction in Patients with Total Knee Arthroplasty in a Hospital in Tehran, Iran

MAHMOUD JABALAMELI [1] , ABOLFAZL BAGHERI FARD[1] , ABOLFAZL NOORI [2]* and HASSAN REZA ANBARLO[3]

[1]Department of Orthopedic Surgery, Shafa Yahiaian Hospital, Iran University of Medical Sciences, Tehran, Iran.
[2]Department of Orthopedic Surgery, Mousavi Hospital, Zanjan University of Medical Sciences, Zanjan, Iran.
[3]Medical Surgical Nursing and Nursing Education, Supervision General Operation Room in the Mosavi Ayatollah Hospital Zanjan, Iran.

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ABSTRACT

Total Knee Arthroplasty (*TKA*) is being used with the main goal of pain reduction and lower extremity alignment correction with a proven positive impact. Surgeons' criterion for the suitability of extremity alignment is to compare them (The angle between femur mechanical axis with tibial mechanical axis) with extremity mechanical axis (a line connecting the midpoint of the femoral head to the midpoint of the talus). Most professionals consider ideal up to 3 degrees difference between extremity alignment with extremity mechanical axis after surgery, thereby increasing the life of the arthroplasty components. In this study, the intention was to show parameters associated with surgery success with the evaluation of patients with ATK successful surgery. In this study, 102 patients with TKA operation in Fajr Hospital of Tehran were selected and required information was extracted from their archived files. Having no arthroplasty after the operation was the main criterion for selecting these patients. Statistical analysis showed that parameters such as BMI, gender, urinary tract infection, and so do not affect the success of ATK surgery. However, it was shown that there is a significant relationship between the success rates of surgery on left knee with the type of surgery. Although there is no significant relationship between some underlying factors such as blood group, gender, or urinary tract infections with the success of TKA surgery, the type of surgery can be an important and determinant factor in the success of the surgery. Statistical analysis on TKA surgery can provide useful information to successfully conduct this type of operation in the future.

Key words: TKA, lower extremity alignment correction.

INTRODUCTION

Development and progress in reconstructive operations has led to major developments in orthopedic surgery such as total knee arthroplasty (TKA) which has been proven to have a positive impact during previous researches so far[1-4]. Since the normalization of extremity alignment after joint replacement will lead to more beauty and also reduce subsequent complications, proper position of components during surgery is of the main concerns of orthopedic surgeon[2].Surgeons' criterion for the suitability of extremity alignment is to compare them (The angle between femur mechanical axis with tibial mechanical axis) with extremity mechanical axis (a line connecting the midpoint of the femoral head to the midpoint of the talus), so that most professionals consider ideal up to 3 degrees difference between extremity alignment with extremity mechanical axis

after surgery (Valgus or Varus)[2, 4-8], and suggest that it causes the life of the arthroplasty components to increase[1, 2, 9-12]. On the other hand, if the angle differences are more than 3 degrees (especially in Varus), IKS score will be lower[11, 13, 14] and losning aseptic and failure will be higher[2, 9, 12, 15-20] But it should be noted that studies have shown that failure in *pre-op varus knee* alignment during TKA in a 2 to 4-year follow-up has not substantially changed IKS (International Knee Society Score)[21]. Researchers also during in-vitro studies on cadavers have shown that the deviation in the range of 3 degree with extremity mechanical axis gives the best results during Gait analysis and dynamic studies[2, 4, 9, 12, 17] .

It has been shown that in the long term, there is no significant difference between patients with knee arthroplasty and Group II that this alignment differs more than 3 degrees with mechanical axis) in the field of revision rate[22, 23]. Dr. Spencer and his colleagues examined TKA cuts in 21 patients using preoperative sagittal MRI, and finally declared that the incidence of postoperative complications (such as bleeding, etc.) in these patients has no significant deference with previous studies with routine surgery or by means of computed assisted methods. And also reported that lower extremity alignment after Surgery with this method will deviate 1 0r 2 degrees to the mechanical axis[24].Dr. Long Staff and his colleagues set out to examine the impact of some aspects of Alaignment and Rotation Implant on Functional Outcome after TKA surgery and analyzed 159 patients clinically and radiologically before and after surgery. Finally proved that a good Coronal Alaignment after surgery results in significant improvements in patients' function during the first year after surgery[14].

Dr. Sikorski et al. stated in a paper that a prospective study with a 15-20 year follow-up is needed to correctly understand the effect of extremity alignment neutering after TKA surgery on the quality of the results requires[4]. Dr. Parat and his colleagues in a paper in 2010, after a 15-year follow-up, investigated the results of the two groups of patients who underwent TKA (the first group were those whose extremity alignment after surgery differed3±0 degrees with extremity mechanical axis and the second group were those who differed more than 3±0 degrees with extremity mechanical axis), and finally, they see no significant clinical, radiological or mechanical difference at the end of 15 years. This group stated that lower extremity alignment correction after TKA surgery is not important[23].

According to the above and also the obligation to investigate the effects of the surgery in Iran, due to the lack of previous researches in Iran, the statistical study of the effectiveness of TKA surgery and the rate of success in of patients in Fajr hospital during the years 2008 to 2013 in this study, due to the different variables associated with infection, hematological parameters and bone mineral density were examined.

METHODS

In this study, 102 patients with TKA operation in Fajr Hospital of Tehran in the years 2008 to 2013 were determined and selected after reading their medical records, in the case of not having varus more than 15 degrees before operation and lack of re-arthroplasty revision during this 5 years operated by a single surgeon and cemented prostheses were used while maintaining cruciate ligament and also the parameters associated with infection and blood group and also the availability of lumbar and femoral bone mineral density results.

Lumbar and femoral bone mineral density with common indicators of T-Score (bone density compared with what is normally expected in a healthy young adult of same sex. T-score is the number of units — called standard deviations — that bone density is above or below the average.) and Z-Score (Z-score is the number of standard deviations above or below what's normally expected for someone of same age, sex, weight, and ethnic or racial origin) and also the corrected angles of the knee after surgery and the type of surgery (ps or cr) were studied. Finally, the data were analyzed with SPSS software.

RESULTS

The study population consisted of 102 patients underwent knee surgery due to knee

problems. 86.4% of them were female and 13.6 percent were male. Based on “Mann - Whitney U” statistical analysis, the effect of gender on the corrected angles of knee after surgery were analyzed and it was shown that gender has no effect on the corrected angles left (p-Value = 0.718) and right (0.886p-Value =) knee. Results indicate that 34.5% of studies subjects had a urinary tract infection. This parameter does not impact significantly on the results of surgery. [(p-Value =0.070) for the right knee and (p-Value =0. 366) for the left knee. The amount of ESR wasn’t normal before surgery in 65.9% of cases and was normal only in 34.1%.

Also, there was no significant relationship between laboratory parameters of ESR, hemoglobin, MVC; RBC; blood group and the amount of angle correction after surgery.

According to the statistical analysis of “Correlations” it was observed that variables related to Z-score don’t affect the corrected angles of left and right knee after surgery. The frequency distribution of lumbar t-score parameter showed that 36.4% of patients were normal, 57.6% had Osteoporese and 6.1% possessed Severe Steoporese. According to the statistical analysis of “Kruscal - Wallis” it was found that this variable doesn’t affect the corrected angles of right (p-Value=0.069) and left (p-Value=0.322) knee after surgery

The frequency distribution of t-score parameter can be seen in the following diagram. By examining this variable it was observed that 6.5% of patients were normal, 61.3% had Osteoporese and 32.3% possessed Severe Steoporese. Therefore, this variable had no effect on the success of the surgery. Finally, the effect of surgery type on the corrected angles of knee after surgical was analyzed using nonparametric statistical of “Mann - Whitney U” that the results of these tests showed that the type of surgery does not affect the corrected angles of right knee (p-Value = 0.279). It is while that statistical results show the effect of surgery type on the corrected angles of left knee (p-Value = 0.015).

The mean of the corrected angles of left and right knee in Ps surgery was equal to 6.2143 and 5.4286, respectively and the mean of the corrected angles of left and right knee in CR surgery was equal to 4.0256 and 4.3158, respectively. So, the mean of the corrected angles in Ps surgery is more than CR surgery.

DISCUSSION

In this study, 102 patients with ATK successful surgery were examined after 5 years and different parameters of these patients were studied. Previous researches and studies about the importance and performance of this surgery had shown that this surgery can lead to relief of pain in patients with varus and valgus. It has also become more and more important due to the direct effect of this surgery on beauty,. It was also shown that varus and valgus angle, before and after surgery is very important[2, 6 7, 9]. In previous studies carried out by Suliman et al. 2011, it was shown that patients’ BMI before surgery has no significant impact on the success of the surgery[25].Also Burg et al. 2009 with a review of 77 patients referred that none of the parameters related to the patient’s blood has effect on the surgery[26] .Also Bozic and his colleagues had shown the lack of effect of urinary tract infection in TKA surgery[27]. Dr. Connor noted the ineffectiveness of gender in TKA surgery in a paper in 2007[28]. In 2002, Breth and colleagues demonstrated that MCV (maximal voluntary contraction) have a significant relationship with the success of ATK surgery[29].

According to a survey conducted in this study, it was shown that there is no significant relationship between gender, BMI, blood infection and factors affecting blood with ATK surgery ahich agrees with previous studies of other researchers, but it was previously shown that MCV has a significant relationship with ATK surgery that no result was obtained to confirm previous results in this study.

The results from the nonparametric statistical test of “Mann - Whitney U” indicates the significant relationship of the effect of surgery type on the corrected angles of left knee (p-Value =

0.015) indicating more success of ATK surgery on left knee independent of sex, BMI, and other factors.

Also, the angular correction in Ps surgery is greater than CR surgery in our study. Therefore, the type of surgery may also be an important factor in the success of ATK.

CONCLUSION

Some underlying factors such as gender, BMI and blood infection have no significant relationship with ATK surgery. But a number of factors such as the type of surgery can be effective in the surgical success rate and angular corrections in TKA surgery.

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