RANGE OF MOTION AFTER TOTAL KNEE ARTHROPLASTY

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SUMMARY

Objective: To evaluate knee range of motion (ROM) after at least six months postoperatively in knee total arthroplasty, by comparing it to baseline value. Materials and Methods: Ranges of motion of eighty arthroplasties were analyzed within an average follow-up of 21.9 months. Results: No significant differences between pre- and postoperative averages for extension (p=0.09) and flexion (p=0.47) were found. By dividing the patients into two groups, a significant flexion improvement was seen in those with pre-op flexion equal or smaller than 90º (n=17) (p=0.000037). In the other group, a significant decrease in flexion was seen in those with pre-op flexion equal or greater than 120º (n=31) (p=0.000068). Four patients have been submitted to knee manipulations within an average of 2.1 months postoperatively. The mean flexion rate before manipulation and after six months was significantly different (p=0.0068). The mean pre-op flexion and after six months postoperatively was similar (p=0.28). Conclusion: Preoperative flexion significantly influences the post-op flexion in knee total arthroplasty. Its measurement provides the surgeon with a good parameter for previewing this.

Keywords: *Range of motion; Arthroplasty; Knee.*

INTRODUCTION

Knee total arthroplasty (KTA) has as an objective to provide relief from pain, correct deformities, and allow a functional range of motion, keeping stability and knee function for daily activities[1]. KTA is an efficient procedure for the treatment of pain and for correcting deformities associated to the degenerative joint disease[2,3].

Despite of the evolutions on surgical techniques, on implants and on postoperative handling, stiffness is still a common problem after KTA[2]. The range of motion (ROM) obtained postoperatively depends mostly of its preoperative score[3-6]. Patient's age and morphology, diagnosis and prosthesis models seem not to influence it[3-5].

The objective of this study is to evaluate ROM in knees of patients submitted to KTA comparing them to preoperative ROM scores.

MATERIALS AND METHODS

Between June, 1995 and July, 2004, 137 KTAs have been performed by the main author at the Hospital Madre Teresa (HMT) in Belo Horizonte (MG). By reviewing patients' medical files, preoperative and 6 months postoperatively ROM scores were obtained. Fifty seven patients who missed the minimum follow-up time of 6 months or those for whom we couldn't find the respective medical files have been excluded, totaling 80 arthroplasties being evaluated.

The mean age of patients was 71.6 years old, ranging from 54 to 91 years old. Sixty nine (86.25%) arthroplasties were performed in women and 11 (13.75%) in men. Forty six (57.5%) arthroplasties have been performed on the right side and 34 (42.5%) on the left side. All prostheses were cemented preserving the posterior cruciate ligament. Four different models were used: Duracon®-Howmedica®(46), Nexgen®- Zimmer®(17), Search®- Aesculap®(9) and Advantin®- Wright®(8). The diagnosis of osteoarthrosis was provided to 76 (95%) cases, rheumatoid arthritis to 3 (3.75%) and osteonecrosis in 1 (1.25%). Average postoperative follow-up was 21.9 months, with the longest being 102 months and the shortest 6 months.

The Student's T-test was used for comparing averages with a significant p value if lower than 0.05.

The research design was approved by the Committee of Ethics in Research at HMT.

RESULTS

Mean preoperative range was 0.6° with a standard deviation (SD) equal to 2.53 and the mean postoperative range was 0.1° (SD=0.78). No significant difference was seen (p=0.09) among pre and postoperative average ranges. Mean preoperative flexion was 107.1° (SD=15.95) and the mean postoperative flexion was 108.6° (SD=11.87), with no significant difference seen among them (p=0.47).

By analyzing the results from another perspective, patients have been further divided into three groups: Group 1 - those with a preoperative flexion ≤ 90º, Group 2 - those with a preoperative

Study conducted at Hospital Madre Teresa, in Belo Horizonte (MG), Brazil.

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flexion ≥ 120°, and Group 3- those submitted to manipulation. The different prosthesis models were uniformly distributed among the groups, and this was not considered as a confusing factor for the analysis of results.

Among the patients with a preoperative flexion lower or equal to 90° (n=17), the mean preoperative flexion was 85° (SD=8.66) and the mean postoperative flexion was 100.5° (SD=9.88). A significant difference was seen between those averages (p=0.000037).

For patients with a preoperative flexion higher or equal to 120° (n=31) the mean preoperative flexion was 123.5° (SD=4.88) and the mean postoperative flexion was 112.8° (SD=13.10). That difference has shown to be significant (p=0.000068).

Six arthroplasties (7.5%) evolved to postoperative stiffness (Group 3). In two patients, a ROM of 80° was accepted and in the others (n=4) manipulation was performed, within 2.1 months postoperatively, in average. The mean flexion for these patients was 107.5° (SD=15) preoperatively, 54.5° (SD=16.76) before manipulation, and 94.7° (SD=16.76) after six months postoperatively. The statistical analysis showed significant differences among the preoperative flexion values and those before manipulation (p=0.000046) and among the flexion averages before manipulation and after 6 months postoperatively (p=0.0068). No significant difference was seen between preoperative flexion and after 6 months postoperatively (p=0.28).

The results are summarized on Table 1.

DISCUSSION

The knee ROM required for daily activities was determined by biomechanical and gait analysis studies. Laubenthal et al..[7] showed that the patients require 67° of flexion during the gait balance phase, 83° for stepping up stairs, 100° for stepping down, 93° for standing up from a chair and between 71° and 117° for catching an object on the floor.

In agreement with the findings by Schurman and Rojer[6] who correlated five different kinds of knee prosthesis to the postoperative ROM, this study could not find a significant difference among the four kinds used.

This study confirms that the preoperative flexion is a valuable parameter for the prognosis of postoperative flexion after KTA, agreeing with the findings by Ritter and Stringer[3], Parsley et al.[5], Harvey et al.[4] and Schurman and Rojer[6]. The mean preoperative flexion was similar to the average after six months of surgery (p=0.47). Ritter and Stringer[3] and Parsley et al.[5] stated that patients with little flexion before surgery tend to gain motion, and those having a bigger flexion tend to loose it. This trend was confirmed in this study. Patients with a flexion ≤ 90° have gained motion (p=0.000037) while those with a flexion ≥ 120° have lost it (p=0.000068).

Despite the technical advancements, stiffness is still a common complication after KTA. There is no universally acceptable criterion for its diagnosis. Stiffness is defined as an inappropriate range of motion for daily activities, resulting in functional restraints[2]. According to literature, its incidence ranges from 8% to 12%[8]. Among the patients in this study, six (7.5%) evolved to a flexion < 90° postoperatively.

Fox and Ross[9] and Esler et al.[10] showed that those patients gained motion after manipulation, achieving a flexion similar to preoperative value, evolving similarly to other patients. These observations are confirmed here. Among the patients submitted to knee manipulation, the flexion averages before manipulation and after six months postoperatively were significantly different (p=0.0068). The averages for preoperative flexion and after six months postoperatively were similar (p=0.28).

	Pre-Operative	Pre-Manipulation	After 6 months P.O.	*P* Value
Extension (n=80)	0.6°	------	0.1°	0.093
	SD=2.53		SD=0.78	
Flexion (n=80)	107.1°	------	108.6°	0.475
	SD=15.95		SD=11.87	
Flexion – group 1 (n=17)	85°	------	100.5°	0.000037
Note: preoperative flexion 90°	SD=8.66		SD=9.88	
Flexion – group 2 (n=31)	123.5°	------	112.8°	0.000068
Note: preoperative flexion 120°	SD=4.88		SD=13.10	
Flexion – group 3 (n=4)	107.5°	54.5°	------	0.000046
Note: patients submitted to manipulation	SD=15	SD=16.76		
Flexion – group 3 (n=4)	------	54.5°	94.7°	0.006862
Note: patients submitted to manipulation		SD=16.76	SD=16.76	
Flexion – group 3 (n=4)	107.5°	------	94.7°	0.281
Note: patients submitted to manipulation	SD=15		SD=16.76	

Source: Medical File Services, HMT

***Table 1** - Comparison among the various ranges of motion, with average, standard deviation (SD) and p value*

CONCLUSION

In the analysis of range of motion after KTA, the preoperative flexion significantly influenced the postoperative flexion. Its measurement provides the surgeon with a good parameter for predicting flexion after arthroplasty.

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