

Mobility in Post-Surgical Knee Arthroplasty with Compression Bandage VS Drainage

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ABSTRACT

Introduction: Post-surgical management of total knee arthroplasty (TKA) includes compressive bandaging or continuous suction drainage. The arches of mobility are evaluated through some validated scales such as the Knee Society Score (KSS) questionnaire, the recovery of these is still uncertain between one management and another for not finding statistically significant differences or presenting a small sample in studies already carried out.

Objective: To compare the mobility arches of patients with compressive bandage vs. continuous suction drainage undergoing TKA.

Methods: Prospective, longitudinal, comparative, analytical study; patients >55 years old undergoing TKA were included. They were grouped according to compressive bandage or continuous suction drainage and the arches of mobility before and after surgery were compared.

Results: 68 patients were registered, 41 (60.2 %) women and 27 (39.8 %) men with a mean age of 66.5 ± 8.3 years. Compressive bandage was applied to 34 patients and continuous suction drainage to the rest. Post-surgery the final score of the questionnaire was 82.76± 8.30 for the compressive bandage group vs. continuous suction drainage 72± 12.80 (p= <0.001), which translates better evolution in bandage group.

Conclusions: The data of the present study suggest that compressive bandaging as a post TKA may result in better patient functionality according to mobility arcs being necessary other studies for validation.

KEYWORDS: Arthroplasty; Quality of life; Motion; Knee osteoarthritis.

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INTRODUCTION

Among the osteodegenerative pathologies, gonarthrosis is the one that represents the highest incidence worldwide, it is an entity in which some risk factors are involved in which we can include obesity as the main one, inflammatory mediators 1 and the mechanical wear of the patient's advanced age that is characterized by an imbalance between the formation and the degradation of the articular cartilage of the knee 2,3 with predominantly pain symptoms as the main cause of seeking medical attention of patients and one of the parameters that are taken in the area of orthopedics to opt for a surgical management of the same, Stiffness especially in the mornings and consecutive loss of the arcs of basic mobility of the knee

taking into account the flexion and extension with sensitivity of instability in advanced stages to be affecting the main static stabilizers of the knee that begin with the personal deterioration of the patient by affecting their daily activities or even incapacitating to the extent of not being able to perform basic activities resulting in a poor quality of life. The evaluation and diagnosis of this pathology must be integral taking into account clinical history with associated risk factors such as obesity, rheumatoid arthritis, strenuous physical activities, forced work throughout life, clinically we will seek to evaluate the arcs of mobility of the knee which are flexion, extension, evaluation of stability with maneuvers such as brush, escape, anterior drawer, posterior drawer,

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medial and lateral yawning, perform basic imaging studies starting with simple radiographs in standing where we will evaluate the standing compartment, medial and lateral femorotibial, more sophisticated imaging studies such as nuclear magnetic resonance or invasive procedures such as joint punctures are not indicated for routine use in the diagnosis of gonarthrosis 4. The management of gonarthrosis should be multimodal. The initial treatment is conservative with patient education about their disease, diet and weight reduction combined with low-impact aerobic exercise with strengthening especially of the extensor apparatus, studies have shown improvement in pain and recovery of the arches of mobility, it has also been observed a reduction in rates of depression and improved quality of life in patients who perform recommended physical activities, physiotherapy with trained personnel and education in strengthening the extensor apparatus, medical management with the pillar of non-steroidal analgesics COX-2 inhibitors (cyclooxygenases), duloxetine type antidepressants are helpful to improve mood, COX-1 or topical steroid analgesics are not indicated due to their low absorption, the use of opioids is preferred when pain is important, there is evidence of management studies with biological therapy but not as common use, The next step of treatment is joint infiltration with visco-supplementation or corticosteroids, however they should not be performed regularly and it is suggested to use them no more than 2 times per year due to possible complications such as joint infection. The most effective treatment is total knee arthroplasty (TKA) which reduces pain and recovers function with excellent results reflected in the patient's quality of life. 5,6

The Knee Society Score (KSS) is a viable and easy to reproduce tool that can be used as a predictor of satisfaction with quality of life in patients undergoing total knee joint replacement. It provides a global assessment of the knee by completing a questionnaire with 7 variables taking into account pain and arches of mobility of the knee, grouping them according to scores of 0-100 points into bad < 60 points, regular 60-69 points, good 70-84 points and excellent 85-100 points where lower scores indicate worse functional capacity of the patient as opposed to higher scores. 7,8 The main complication after a total knee joint replacement is the inflammation of the mid-thigh towards the ankle which is caused by 2 issues, the first is the intra-articular and soft tissue bleeding after making the incision in the skin, subcutaneous cellular tissue and joint capsule where small capillaries and venous networks are sectioned, the second point is the use of ischemia cuff in the thigh causing edema and significant ecchymosis in the patient. There are other post-surgical complications in total knee arthroplasty such as the decrease in hemoglobin levels due to the procedure, infection and pain derived from the irritation of the articular capsule with the consequent loss of mobility arcs in the sagittal plane of the knee limiting flexion and extension. 9 There are measures that can be carried out so much previous to the surgical procedure

as to use compression stockings simulating a bandage of jones or later to the surgery one of them the placement of dressings or compresses in anterior face of surgical wound and later in popliteal hollow together to the compressive bandage¹⁰ with its specific advantages opposite to by not placing any management^{11,12} individualizing the pre-surgical history in the patient the most relevant would be the lymphedema already presented by patients in this case can also be placed bandage or compression stocking similar prior to surgical event with good functional results¹³ these tools are useful to prevent infection, decrease bleeding, improve functionality and rapid recovery of ambulation^{14,15}, we have another option for post-surgical management which is the placement of a continuous suction drainage system routinely used by orthopedic surgeons worldwide without seeing the risks and benefits that presents¹⁶ with its variants according to the use in terms of maintaining clamped for different periods of time^{17,18} with advantages related to rapid recovery by not influencing complications such as blood loss according to international literature¹⁹ as well as disadvantages mainly infection to be a direct communication of the external environment with the joint²⁰, increase in the total number of days of hospitalization or loss of proprioception. 21 Currently, the use of a compression bandage as monotherapy over continuous suction drainage²² is still under discussion because there are no statistically significant differences in the scores with different scales in research already conducted or there are no studies with a large sample that support the use of compression bandage even mentioning that it may have adverse effects such as discomfort, peroneal nerve injury, pressure ulcers, hematomas, dermal blisters.^{23,24} however, total knee arthroplasty significantly improves the quality of life in patients. 25

The aim of this study was to evaluate arches of mobility in post-surgical total knee arthroplasty patients comparing compressive bandaging vs. continuous suction drainage in the short term (4 weeks) according to the KSS questionnaire.

MATERIAL AND METHODS

68 patients previously studied in the orthopedic outpatient clinic in the knee module were collected, where data such as knee pain presented by the patient when performing activities of daily living were recorded. A detailed physical examination was performed including flexion, extension of the knee, anterior drawer, posterior drawer, lateral yawning, medial yawning, clinical attitude of the knee evaluating varus or valgus deviation using a 360° goniometer by the same researcher collecting the necessary data for the KSS questionnaire, Anteroposterior (AP) and lateral radiographs of the knee in bipedestation were requested, reaching the diagnosis of gonarthrosis in advanced stages candidates and submitted to a total knee arthroplasty with different types of constriction performed by different orthopedic surgeons with 2 types of post-surgical management according to the criteria

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of each surgeon, a compressive bandage was placed in the first group of patients and in the second group a drainage by continuous suction in the Hospital de Especialidades No. 1 Centro Médico Nacional del Bajío, IMSS, in León, Guanajuato, Mexico, from March 1, 2022 to June 30, 2023.

The study was prospective, longitudinal, comparative, analytical and was divided into 2 groups (according to the surgeon's criteria), the first group of 34 patients in whom a compressive bandage was placed and the second group of 34 patients in whom a continuous suction drainage was placed.

Prior to the surgical intervention, the procedure was explained, the follow-up to be performed and informed consent to participate in the research protocol was signed.

After knee arthroplasty, the results of the KSS questionnaire were obtained from each patient at the outpatient orthopedic office at 4 weeks after the knee arthroplasty.

ETHICAL ASPECTS

For the realization of the present research study, after authorization by the local health research committee and the local ethics committee with folio (R-2022-1001-093), written informed consent was obtained from all participating patients. The proposed procedures are in accordance with ethical standards, the regulations of the General Health Law on Health Research, the Helsinki Declaration of 1975 and its amendment, as well as current international codes and standards for good practice in clinical research.

With regard to patient safety and well-being, the principles contained in the Nuremberg Code, the Declaration of Helsinki and its amendment, the Belmont Report and the U.S. Code of Federal Regulations (Common Rule) were fully respected.

INCLUSION, EXCLUSION AND ELIMINATION CRITERIA

Patients of both sexes aged 55-80 years with a diagnosis of advanced stage gonarthrosis who underwent RTA with post-surgical management of compressive bandaging or

continuous suction drainage and who agreed to participate in the study were included.

Patients with a diagnosis of early stage gonarthrosis under 55 years of age who were not candidates for surgical management were excluded.

Patients were eliminated if for administrative reasons, such as change of address to another state or clinic assignment, they could not continue their follow-up appointments through the outpatient clinic or if for any reason they did not conclude the follow-up.

STATISTICAL ANALYSIS

Qualitative variables such as severity of disability assessed by KSS scale, pain intensity and knee stability were presented as frequency or percentage. Discrete quantitative variables such as measurements obtained by goniometer and absolute scale score were described as mean and standard deviation.

The comparison between the groups (compressive bandage vs. continuous suction drainage) of the qualitative variables was performed using the chi-squared test, of the quantitative variables with the Student's t-test for independent samples.

For all inferential statistical analyses, values of $p < 0.05$ will be considered as significant.

RESULTS

During the period between March 1, 2022 and June 30, 2023, a total of 68 patients who fulfilled the inclusion criteria were included in the outpatient clinic of the knee module in the orthopedics service of the Hospital de Especialidades No.1 Centro Medico Nacional del Bajío, and were candidates for RTA with different types of constriction due to advanced gonarthrosis. 41 (60.2%) were women and 27 (39.8%) were men, with a mean age of 66.5 ± 8.3 years. The result regarding the disaggregated KSS score obtained before (pre-surgical) and 4 weeks after (post-surgical) RTA is described in Table 1; reporting significant difference in most of the variables, except for anteroposterior and medio-lateral stability.

Table 1. Pre- and post-surgery scores (KSS) of the study population.

	n= 68		
	Pre-surgical	Post-surgical	value of p
Pain (0-25)	0	14.8 ± 4.7	$<0.001^{a,b}$
Contracture in flexion [0- (-5)].	-1.4 ± 1.8	-0.2 ± 0.7	$<0.001^{a,b}$
Extension deficit [0- (-15)].	-3.2 ± 4.7	-0.8 ± 2.2	$<0.001^{a,b}$
Total bending range [0-(+25)].	16.5 ± 2.9	18.38 ± 3.4	$0.001^{a,b}$
Varus-valgus alignment [0-(+25)].	-1.6 ± 15.7	22.1 ± 8.3	$<0.001^{a,b}$
Stability A-P [0-(+10)].	10.5 ± 2.0	11.1 ± 2.5	0.197^a
Medio-lateral stability [0- (+15)].	14.1 ± 2.6	13.8 ± 2.5	0.419^a
Final score	77.3 ± 11.9	45.3 ± 16.1	$<0.001^{a,b}$

KSS (Knee Society Score); A-P (Anteroposterior)

Values are expressed as mean \pm standard deviation;^a student's t, ^b significant p value.

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The total population was then divided into 2 groups of 34 patients according to the post-surgical management received, either with compressive bandaging or continuous suction drainage.

When the KSS was applied before surgery, no significant difference was found in the final score or in any of the variables considered by this questionnaire. However, when

patients undergoing RTA were evaluated 4 weeks after the procedure, a higher score (better functionality) was found 82.76 ± 8.30 in patients who underwent compressive bandaging versus continuous suction drainage 72 ± 12.80 ($p < 0.001$). A significant difference was also reported between the variables flexion contracture and extension deficit ($p = 0.002$ for both) (Table 2).

Table 2. Demographic characteristics and KSS score according to treatment.

	Compressive bandage (n=34)	Continuous suction drainage (n=34)	value of p
<i>Sex</i>			
M	38.20%	41.10%	
F	61.70%	58.20%	0.12 ^b
<i>Age</i>	66.88 ± 8.02	66.12 ± 8.80	0.71 ^a
<u><i>Pre-surgical KSS</i></u>			
Pain (0-25)	10.44 ± 5.55	8.24 ± 5.88	0.11 ^a
Contracture in flexion [0- (-5)].	-1.47 ± 1.61	-1.38 ± 2.04	0.84 ^a
Extension deficit [0- (-15)].	-3.50 ± 4.49	-3.09 ± 5.07	0.72 ^a
Total bending range [0-(+25)].	16.35 ± 2.44	16.79 ± 3.37	0.53 ^a
Varus-valgus alignment [0-(+25)].	-2.94 ± 15.18	-0.32 ± 16.74	0.5 ^a
Stability A-P [0-(+10)].	10.88 ± 1.93	10.29 ± 2.11	0.23 ^a
Medio-lateral stability [0- (+15)].	13.68 ± 2.83	14.71 ± 2.44	0.11 ^a
Final score	45.09 ± 15.85	45.71 ± 16.94	0.87 ^a
<u><i>Post-surgical KSS</i></u>			
Pain (0-25)	15.71 ± 4.79	13.91 ± 4.66	0.12 ^a
Contracture in flexion [0- (-5)].	0	-0.56 ± 0.96	0.002 ^{a,c}
Extension deficit [0- (-15)].	0	-1.76 ± 2.98	0.002 ^{a,c}
Total bending range [0-(+25)].	19.09 ± 1.21	17.68 ± 4.70	0.09 ^a
Varus-valgus alignment [0-(+25)].	22.59 ± 6.28	21.62 ± 10.13	0.63 ^a
Stability A-P [0-(+10)].	11.18 ± 2.15	11.03 ± 2.95	0.81 ^a
Medio-lateral stability [0- (+15)].	13.82 ± 2.15	13.82 ± 3.03	0.9 ^a
Final score	82.76 ± 8.30	72 ± 12.80	<0.001 ^{a,c}

KSS (*Knee Society Score*); A-P (*Anteroposterior*)

Values are expressed as mean ± standard deviation;^a student's *t*,^b chi-squared,^c significant *p*-value

DISCUSSION

Mobility arches following RTA with compression bandage management alone are reflected in better outcome rates according to the KSS questionnaire. Therefore, it should be considered as a viable postoperative treatment option in RTA.

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The mean age of the patients was 66.5 (± 8.3) with a predominance of female sex (60.2 %), which coincides with the currently reported literature.

The KSS questionnaire applied preoperatively and postoperatively can predict patient satisfaction with gonarthrosis directly related to the arches of mobility.²⁷

This study included patients with gonarthrosis who were candidates for any RTA implant, presenting low scores according to the KSS questionnaire prior to surgery.

After the surgical procedure (RTA), the group in which only a compression bandage was applied showed better post-surgical results (good to excellent) compared to the group of

drainage with continuous suction (regular and good) by the KSS evaluation. The use of only a compression bandage was of great utility contrary to those mentioned in the international literature²⁸, which would represent a lower cost of supplies as opposed to continuous suction drainage.

It is suggested that there is still a lack of evidence for the frequent use of continuous suction drainage as postoperative management of RTA and that it is sometimes used routinely.²⁹

CONCLUSIONS

The data of the present study suggest considering compressive bandaging as immediate management after RTA because it presents better functional results taking as reference the mobility arches according to the KSS questionnaire with predominantly good (58.8 %) and excellent (38.2 %) scores compared to continuous suction drainage with fair (35.2 %) and good (52.9 %) results.

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