Research article

Assessment of knee osteoarthritis treatment in patients attending the University Hospital of Kinshasa, Democratic Republic of Congo

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Abstract

Objectives: To assess the effectiveness of treatment in knee osteoarthritis (OA) patients at the University Hospital of Kinshasa.
Design: A cross-sectional outpatients study.
Setting: The present study analyzed eight months data (from 3rd January to 28th August 2012).
Methods: One hundred and one patients were included in the study, of whom 78 were females. Their average age was 58.8 ± 10.0 years. The mean values of the strength quadriceps were 18.99 ± 6.29 Kgf and 20.58 ± 6.24 Kgf on the left and on the right respectively. All patients received Nonsteroidal Anti-Inflammatory Drugs (NSAIDs). Injections of betamethazone in the knee were done in 73 patients. Quadriceps toning sessions were performed by 72 patients, as home self-rehabilitation for 57 patients (79, 2%) and by a kinesist at the UHK for 15 patients (20.8%). A significant reduction of pain intensity and functional disability was observed after one week of NSAIDs ($p < 0.001$). Steroid injections significantly reduced pain and improved joint function between inclusion and 4 weeks later ($p < 0.001$). The quadriceps toning exercises improved the quadriceps strength and knee flexion after 4 weeks of treatment ($p < 0.001$).
Results: Demographic and clinical data, and X-rays damages were noted. The primary endpoint was the measurement of Mansat and Lequesne score, the quadriceps strength and pain/VAS, and the secondary endpoint was their evolution after treatment.
Conclusion: The present study shows a good clinical evolution of knee OA during the first month of medical and physical treatment in Congolese patients.

Key words: Knee osteoarthritis, Treatment, Kinshasa

Introduction

Osteoarthritis (OA) is the most common joint disease[1,2]. Its prevalence is high worldwide and in all ethnic groups. The knee is one of the main sites of this condition, in part because it is a load-bearing joint[3-5]. Its prevalence is perfectly correlated with age. It's rare in people aged under 30 years and it is very common after 60 years[1-5]. OA is more frequent in women aged over 50 years[6]. Obesity promotes the onset of the knee OA because of excessive mechanical stress and the destructive effect of adipokines on articular cartilage[7,8]. The management of knee OA includes pharmacological treatment and non-pharmacological treatment, with the objective of reducing joint pain and functional disability. Pharmacological treatment is mainly based on the administration of analgesics and non-steroidal anti-inflammatory drugs. Proteoglycan drugs are also fairly widely used. Singh *et al*[9] reported the clinical benefit of chondroitin in the treatment of osteoarthritis over one semester. Intra-articular steroid injection is often used in clinical practice with satisfactory results. Matzkin *et al*[10] observed that steroid injection resulted in significant pain reduction and functional improvement in all patients during the first trimester of care. This beneficial effect was unfortunately not maintained during the evaluation made after 6 months. Hyaluronic acid is also administered locally as a viscosupplementation. Several studies have reported its beneficial effects on knee OA[11-16]. Platelet-enriched plasma or conditioned autologous serum can also be injected into a joint with OA[17, 18].

Apart from medical treatment, physiotherapy and surgical treatment may also be performed to take care of patients suffering from knee OA. A Spanish study

showed that the combination of an intra-articular injection of conditioned autologous serum and physiotherapy led to a rapid pain regression which was maintained for at least 2 years.

The objective of the present study was to assess the effectiveness of pharmacological and physical treatment in patients followed for knee OA at the University Hospital of Kinshasa (UHK).

Materials and methods

A cross-sectional study was performed. It was carried out on patients suffering from knee OA and who attended the Rheumatology unit of the UHK, from 3rd January to 28th August 2012. Patients were recruited consecutively.

Inclusion criteria

To be included, the patient had to give consent to participate in the study and meet the criteria of the American College of Rheumatology for the diagnosis of gonarthrosis[20]: (i) gonalgia; (ii) age over 50 years; (iii) morning stiffness of less than 30 minutes; (iv). Joint crunches; (v). radiographic osteophytosis. The diagnosis was made when the patient met criteria i, v and one of the other three criterias.

Those excluded were patients who suffered concomitantly from a debilitating condition or likely to interfere with the measured indices (lumbar pain radiating to the lower limbs, crural neuralgia, pain in the ankle or foot), patients who had a history of knee or hip surgery and those who refused to participate in the study.

The age and sex of patients were noted. Anamnestic data included the pain/VAS, notion of trauma on the knee. The intensity of the pain was evaluated by the analog visual scale ranging from 0 to 100 mm, 0 meaning the absence of pain and 100 mm the most intense pain that one can imagine. Pain intensity assessment was done at the start and after a week of NSAID treatment and 4 weeks after an intra-articular steroid injection.

Anthropometric data: Weight, height, body mass index, length of lower limbs, perimeter of thighs. Body weight was determined using a Seca brand scale and height was determined using a height gauge. The body mass index was calculated by the formula BMI = Weight (Kg) / (Height in m). The length of the lower limbs and the perimeter of the thigh were measured with a tape measure.

The strength of the quadriceps: The quadricipital force was measured using a German-made mechanical dynamometer, of the Pocket balance type. The use of this instrument is based on Hooke's law[21]. Since an ideal spring follows a relationship of type Force = stiffness x elongation. The value of a force can be deduced by measuring the elongation of a calibrated spring. It was an isometric muscle assessment. The evaluation of muscle strength was performed in a standardized manner according to the recommendations of Wilk[22]. The test was preceded by a 10-minute warm-up on a bicycle at an average speed of 60 rotations per minute. The patient, seated on a chair, had to perform flexion-extension movements of the knee at different angular speeds. The muscle strength measurement was carried out in concentric mode, at maximum power and bilaterally, starting with the member corresponding to the most painful knee. The functional assessment was made using the Lequesne's index and the Mansat's score. Lequesne's index explores three areas: pain or discomfort (8 points), maximum walking distance (8 points) and difficulties in daily life (8 points). It is rated on 24 points, 0 being the best score. Mansat's score explores 4 areas: pain (6 points), mobility (4 points), stability (4 points) and muscle strength (4 points). The maximum possible score is 18 and corresponds to the best score (no functional impact).

(i) *Radiographic data:* The radiographic images were taken before inclusion, in comparative incidence in front load, in extension and in Schuss, in profile incidence and femoropatellar incidence of 60 degrees. They were interpreted by the musculoskeletal unit of the CUK Medical Imaging Department.

(ii) *The prescribed treatment:* All patients had received short-acting NSAID therapy. Those who had not responded to NSAIDs or who had previously self-medicated with NSAIDs had been subjected to joint infiltrations of betamethazone. They were divided into 2 groups: those who had received a single infiltration on the one hand and those who had received at least 2 on the other. Non-pharmacological treatment included quadriceps toning exercises and other rehabilitation procedures. Quadriceps toning was done at the hospital for the first group and at home (self-rehabilitation) for the second group. At the hospital, quadriceps toning exercises were provided by a physiotherapist at the rate of 4 sessions per week for 3 months. Patients who did self-rehabilitation began by taking physiotherapy sessions in the hospital at the rate of 2 sessions per week for 2 weeks. Then, the patients themselves continued these exercises at home at the rate of 4 sessions per week for 3 months. The other rehabilitation methods were only practiced in the patients of the first group: massage of the thigh muscles, brisk walking on a mat and pedaling on a bicycle.

Quantitative data were presented as means (SD), qualitative variables as n (%), with a 95% confidence interval. The X^2 test was used to compare the proportions and the Students t-test to compare means. The simple linear regression was used to model the relation between the quadricipital force and the perimeter of the thigh. The analysis of variance was used in order to compare average values of pain and functional index, and strength of the quadriceps during the study progression. Tukey's post hoc test allowed multiple comparisons of averages. A p-value <0.05 was considered as the threshold of statistical significance.

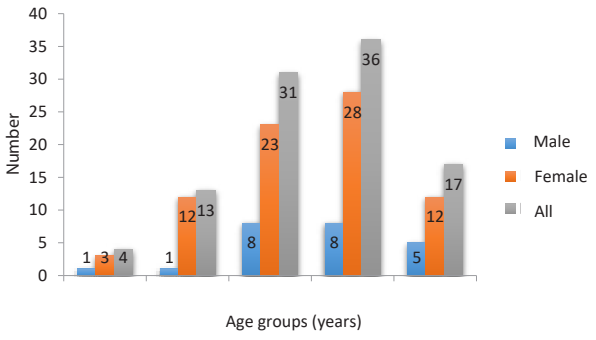
Results

One hundred and one patients (78 females and 23 male) were included in the present study. Their average age was 58.8 ± 10.0 years. Ninety three patients were at least 45 years old. Figure 1 shows the distribution of patients according to age. Table 1 summarizes the general characteristics of the patients. The mean values of the quadricipital force among the patients included in the study were 18.99 ± 6.29 Kgf and 20.58 ± 6.24 Kgf respectively on the left and on the right. At the hamstring level these mean values were 20.58 ± 6.29 Kgf and 10.72 ± 3.63 Kgf respectively on the left and on the right. The average thigh perimeters were 57.37 ± 4.8 cm and 57.93 ± 4.99 cm on the left and right, respectively.

Table 1: General characteristics of patients

Variables	
Male n (%)	78 (77.2)
Female n (%)	3 (22.8)
Age (years)	58.9±10.0
BMI (kg/m^2)	27.9±5.4
<30 kg/m^2 [n(%)]	73(72.3)
≥30 kg/m^2	28 (27.7)
Delay of symptoms (years)	5.3±3.4
Symptoms [n (%)]	
Knee pain	101(100)
Crepitus	80 (79.2)
Knee swelling	30 (29.7)
Movements limitation	28 (27.6)
joints deformations	37(36,6)
Kellgren-Lawrence steps [n (%)]	
1	6 (5.9)
2	23 (22.8)
3	35 (34.7)
4	7 (36.6)

Figure 1: Distribution of patients according to age



Figures 2 and 3 show the relationship between the thighs perimeter and the strength of the quadriceps. The simple linear regression analysis revealed that the quadriceps force was not influenced by the perimeter of the thigh (p = 0.54 on the left and 0.69 on the right).

Figure 2: Relationship between the right quadriceps strength and the perimeter of the thigh

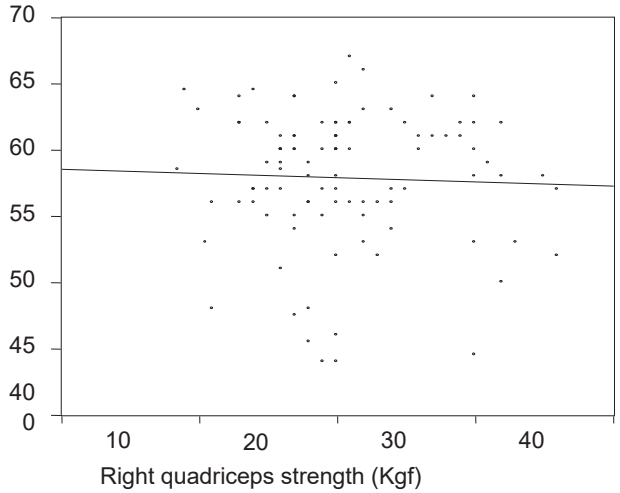
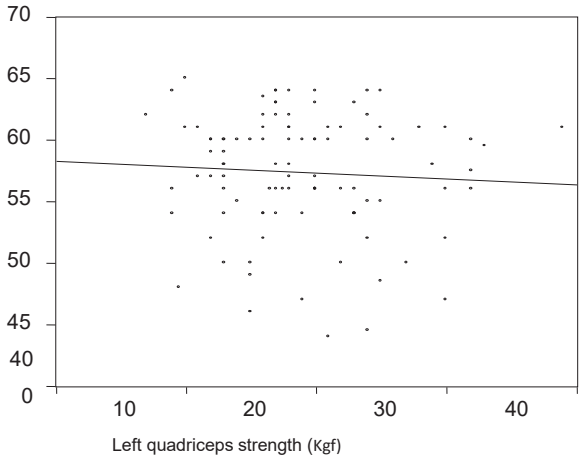


Figure 3: Relationship between the left quadriceps strength and the perimeter of the thigh



Left quadriceps strength = 23.67549097+ [(- 0.08159140546) x volume of the thigh]

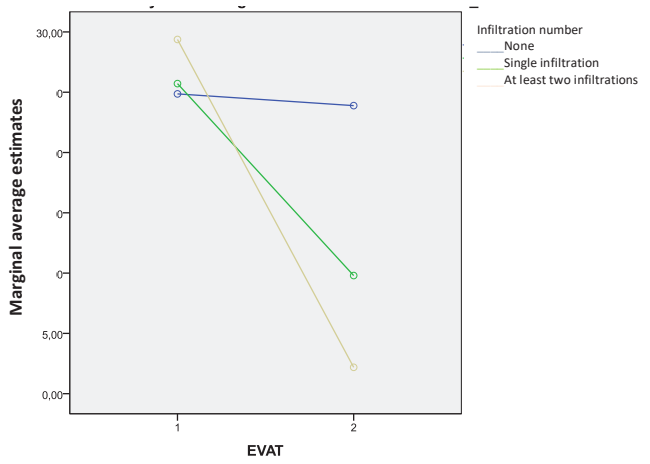
Pharmacological treatment

All patients received NSAIDs. Seventy three patients (72.3%) received injections of betamethazone in knees: one injection for 55 (54.5%) patients, 2 injections in 13 (12.9%) patients and 3 injections for 5 patients (4.9%) patients.

Table 2 summarizes the effects of NSAIDs on pain and the level of functional disability. It should be noted that after one week of treatment with NSAIDs, there was a significant reduction of pain intensity and functional impairment (p <0.001). Figure 4 shows the effect of steroid injection on the VAS. This figure shows that the average level of VAS regressed significantly between the start of treatment and 4 weeks later (p <0.001). The regression of the VAS was lower in patients who did not receive intra-articular steroids injection than in those

who received at least one (p <0.029). This regression was greater in patients who received at least two injections than in those who received only one (p <0.001).

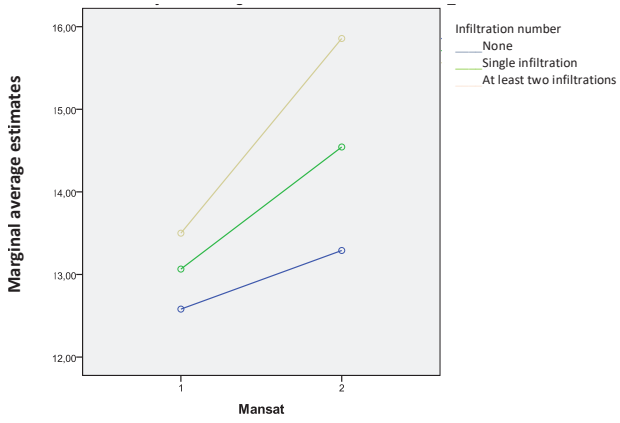
Figure 4: Effects of steroids injection on the pain intensity



EVAT=Evolution of EVA over time. 1= Start of treatment, 2= 4 weeks after

Figure 5 shows the progression of functional disability according to the Mansat's score. It allows us to observe a functional improvement of the arthritic knee at inclusion and after 4 weeks of treatment with steroids injections (p <0.001). The improvement was greatest in patients who received more than one infiltration. In addition, patients who did not benefit from joint steroid injections had a poorer course than those who received at least one (p <0.048).

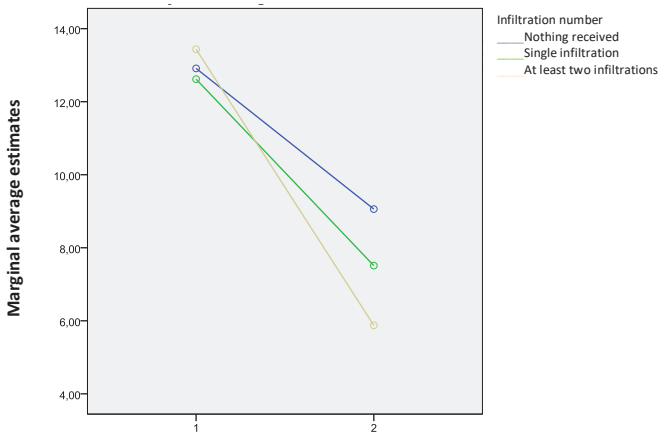
Figure 5: Effects of joint steroids injection on the Mansat score



1 = At the start of treatment 2 = After four weeks

Figure 6 shows schematically the same functional evolution according to the Lequesne index. This figure shows that the Lequesne index improved significantly between the start of treatment and 4 weeks later (p <0.001). This improvement was greater in patients who had received more than one joint than in those who had received only one (p <0.001); and in patients who received at least one infiltration than in those who did not (p = 0.043).

Figure 6: Effect of joint steroids injection on the Lequesne index



1 = Before treatment 2 = After treatment

Non-pharmacological treatment

Seventy two patients underwent quadriceps toning sessions, including 57 (79.2%) in home self-rehabilitation and 15 (20.8%) in hospital. Figure 7 shows the evolution of the strength of the quadriceps after toning exercises. It shows that there was an improvement in quadriceps strength both in patients who had performed self-rehabilitation and in those who were followed in hospital (p <0.001).

Figure 7: The evolution of the quadriceps strength after toning exercises

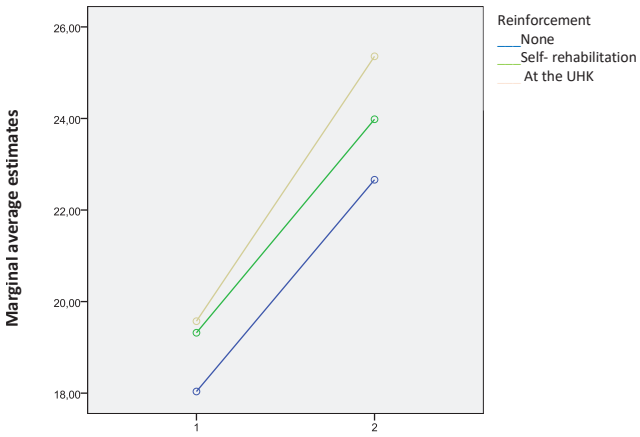
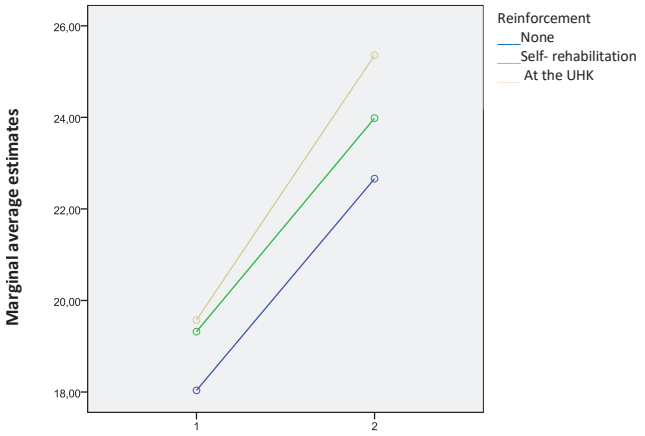


Figure 8 summarizes the impact of quadriceps toning on the knee flexion range. It shows that the improvement in quadriceps tone was accompanied by that in the knee flexion range. Indeed, the increase in the range of motion of the knee was much higher in patients who underwent quadriceps toning sessions than in those who did not (p <0.001). In addition, hospital rehabilitation had better results than self-rehabilitation (p = 0.047). The VAS and functional indices used in the present study showed improvement after one month of treatment, whatever it was.

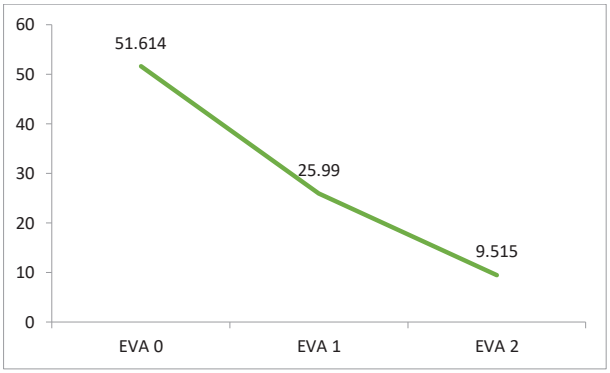
Figure 8: Effect of quadriceps toning on the knee flexion range



1 = Start of quadricipital toning, 2 = 3 months after the start

Figure 9 shows that the VAS / pain had significantly decreased between inclusion and after four weeks of treatment (p <0.001). Figure 10 shows a significant improvement of Lequesne score between initial assessment and 4 weeks later.

Figure 9: The evolution of the VAS during the study



0 = Before treatment, 1 = During treatment, 2 = After treatment

Figure 10: Evolution of the Lequesne's score during the study

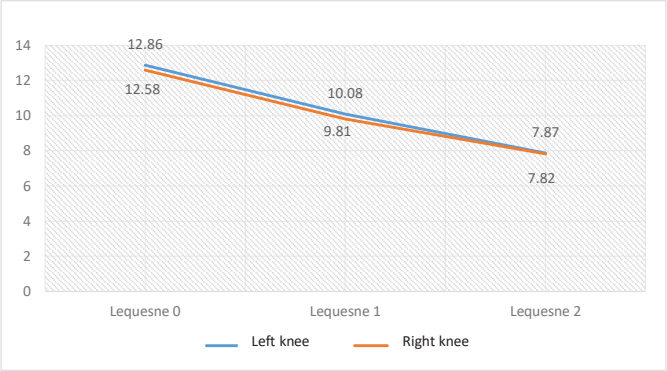
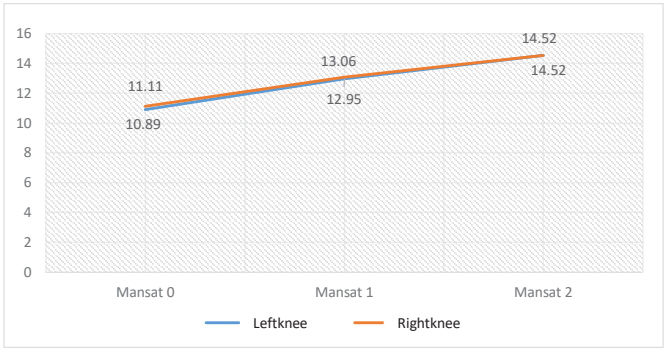


Figure 11: Evolution of the Mansat's score during the study



Discussion

The present study observed that knee osteoarthritis predominated in females and those aged over 50 years old. The literature reports that after the age of 50 years, osteoarthritis is more common in women than in men[1, 24]. This female predominance could be due to menopause by mechanism not yet elucidated. Estrogen deficiency could explain the acceleration of the breakdown of cartilage either by an action on chondrocytes or on bone cells[25]. Obesity is also likely to play a role in this female dominance, since studies in sub-Saharan Africa have shown that obesity is more common in females[26,27]. Psychosocial factors may also play a role in the fact that there are more females than males counted in osteoarthritis. At the same pain intensity, women would consult more often than men[28]. Age-related factors such as impaired cell and tissue function, sarcopenia, loss of conception, and increased ligament laxity, combined with other factors such as obesity, trauma and other factors genetics favor the occurrence of knee OA[29].

The results of the present study showed that the quadriceps strength was not influenced by the perimeter of the thigh. In principle, the strength of a muscle is directly proportional to its volume and therefore to its perimeter. But the latter is also influenced by the volume of adipose tissue. Given the fairly large number of obese or overweight patients we may imagine that the thigh perimeter that was measured in each patient does not only reflect muscle mass and is also influenced by volume of adipose tissue. Hence, the lack of correlation between the perimeter and the quadriceps strength.

The medical treatment had led to clinical improvement in patients in view of the positive development of the VAS and the functional indices. The objective was to conduct a comparative study between patients undergoing drug treatment and those receiving a placebo to better highlight the benefit of the treatments administered. A number of studies elsewhere have shown that steroids injections

work better than placebo in patients followed up for 4 weeks. Beyond this time, steroids injections were not shown to be superior to placebo. A similar finding is reported for NSAIDs whose benefits over placebo seem to fade over the weeks[30].

Therefore, our results are similar to those reported in the literature and which have observed a clinical improvement after NSAIDs treatment or steroid injection during the first month of treatment. The fact that our study did not go beyond one month of treatment does not allow us to comment on the benefit of treatment for a longer period.

The quadriceps toning exercises were performed in order to obtain an increase in quadriceps strength. The results of the present study indicate that the strength of the quadriceps increases as much in patients who have followed physiotherapy sessions as in those who did not. This increase in the strength of the quadriceps is greater in those who have followed physiotherapy sessions but not significantly. A study on a larger sample would better assess the benefit of toning exercises on the strength of the quadriceps. On the other hand, the rehabilitation exercises brought both a reduction in the intensity of the pain and an improvement in the range of flexion of the knee. This observation underscores the clinical value of functional rehabilitation in the management of knee OA. Several authors have reported a clear regression of symptoms in the medium and long term in patients followed for knee OA, with in particular a functional improvement and a reduction in the consumption of analgesics[31-33]. In a randomized study comparing the benefit of physiotherapy to that of intra-articular corticosteroid injections in patients followed for knee OA, Deyle *et al*[32] observed a better evolution of the WOMAC indices in patients who followed physiotherapy sessions.

The present study has some limitations. First of all**,** the small size sample makes that we cannot automatically generalize our results to all Congolese patients. Apart from that it's difficult to be sure that patients of the self-rehabilitation group were compliant with their home exercises. Another limitation is the lack of placebo arm for patients treated with NSAI.

Conclusion

This study has shown that NSAIDs, intra-articular steroids injections and physiotherapy have improved the clinical feature (pain intensity and functional scores) of knee OA in Congolese patients during the first 4 weeks of treatment. A larger sample size and long-term study is needed for a better evaluation of these treatment.

Strengths and limitations

(i) This is the first study to assess the treatment of knee osteoarthritis in Congolese patients.
(ii) The use of clinical and measurable scores helped to have an objective assessment.
(iii) The small sample size and the short delay of follow-up mean that the results of the present study must be taken with caution.
(iv) A study on a larger sample and for a longer period is needed.

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Competing interests: None declared.

Patient consent: This was obtained.

Ethics approval: The present study was approved by the ethics committee of the University of Kinshasa.

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