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Open surgical arthrolysis for post-traumatic knee stiffness: Mid-term functional outcomes

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Abstract
Knee stiffness is a very disabling post-traumatic complication. The objective of our study was to evaluate the mid-term functional results of patients treated by open arthrolysis for knee stiffness in Togo.
Patients and methods: This is a prospective descriptive cross-sectional study, conducted between January 1, 2019, and December 31, 2021, carried out in two hospitals in Togo. It consisted of patients who presented with severe post-traumatic knee stiffness and were treated surgically. The sample consisted of one woman and 5 men whose average age was 37.5 years. The stiffness was in flexion in five patients and one case of stiffness in extension. The patients initially presented with open trauma to the knee due to a road accident.
The mobility arcs were informed using a goniometer. The functional evaluation was carried out using the IKS knee and IKS function scores. Complications were also listed.
Results: The average length of hospitalization was 23.8 days with extremes of 5 to 90 days.
The average IKS knee score is 75/100 (31-88); and that IKS function was 100 in 05 patients and 50/100 in one patient with an average of 92/100 (Table II).
Five patients felt little and occasional pain. A patient felt pain when walking. Average patient satisfaction was 28/40 with extremes between 6 and 40/40.
Conclusion: Surgical knee arthrolysis according to the great liberation of Judet is a safe, effective and durable technique. It helps improve the quality of life of patients by increasing knee mobility and thus facilitating certain movements of daily life.

Keywords: Stiffness, knee, flexion, extension, arthrolysis, physiotherapy, Togo

1. Introduction
Knee stiffness is a post-traumatic complication frequently encountered in daily practice [1]. It is very disabling on a daily basis because it causes discomfort with each movement, severe pain and prevents the patient from carrying out all daily movements with ease.
Stiffness can be in flexion, extension or mixed. The causes are diverse. It can result from a fracture, ligament trauma or the consequence of muscle retraction after a fracture [2]. It can also result from immobilization of the knee or an infection. Several therapeutic modalities are offered in cases of knee stiffness. Knee mobilization by a physiotherapist using analgesics and anti-inflammatories. If this fails, mobilization under general anesthesia may be offered to the patient depending on the cause of the stiffness or an arthroscopic knee arthrolysis or an open arthrolysis [3]. This last technique is called the great liberation of Judet [4]. In Togo, this technique, although little practiced, has made it possible to improve the quality of life of patients. Given the severity of the stiffness that our patients present and given the technical platform, arthroscopic surgical arthrolysis is not performed.
Our objective was to evaluate the functional result in the short and mid-term. Our hypothesis is that open surgical knee arthrolysis is a technique capable of improving the management of post-traumatic knee stiffness in the short and mid- term.

2. Patients and Methods
2.1 Patients
This is a two-center prospective descriptive cross-sectional study, conducted between January 1, 2019, and December 31, 2021. This work was carried out in the two hospital centers in Togo.

It consisted of patients who presented severe post-traumatic knee stiffness. The sample consisted of one woman and 5 men whose median age was 37.5 years.
Stiffness was located on the left in five patients. Pain and discomfort when bending was the reason for consultation. One case of severe pain with VAS 7, four cases of moderate pain with VAS rated 4 to 5 and one case of mild pain.
Almost all of the patients initially presented with open knee trauma from a public road accident. The initial management of bone lesions was carried out between D30 and M2 post-traumatic.
Osteosynthesis using condylar plate and DCS was performed in the 3 patients with fracture of the femoral condyles. Osteosynthesis using a locked nail and orthofix external fixator in a patient with Fraser type IIa floating knee.
In all patients, the stiffness was due to a post-traumatic knee infection. The cytobacteriological examination isolated multi-resistant Staphyloccocus aureus in 5 patients and Klebessiela pneumoniae in one patient. The stiffness was in flexion in five patients (Table II) and one case of stiffness in extension, the severity of which was classified according to SOFCOT [5].

Table 1: Table for assessing the severity of stiffness according to SOFCOT

	Very seriuos	Serious	Moderate
Flexion	< 30°	< 50°	50 -70°
Extension	10°	5°	10°
Patient number	2	1	3

Five patients presented with quadriceps amyotrophy.
The average initial knee IKS score was 44 with extremes between 23 and 68/100. The IKS function score was 53/100. The overall IKS score was 97/200. Patient satisfaction was rated at 11/40, ranging from 0 to 16/40.
All patients had a standard x-ray of the knee and the affected thigh (Fig.1)

Fig 1: Calcification of the patellar tendon with bone sequestration of the patella responsible for stiffness in extension

2. Therapeutic protocol

Surgical technique

The patients were placed in lateral decubitus with pubic and Sacro gluteal support. Loco-regional anesthesia associated or not with epidural analgesia was performed. The approach was posterolateral and starts from the patellar ligament, follows the posterolateral edge of the thigh and curves, if necessary, towards the anterior edge of the anterior superior iliac spine.
The quadriceps sac, the condylar cheeks and the joint cavity were released. It was carried out by arthrotomy, by section of the straps and excision of the infrapatellar fibro-adipose tissue, then release of the medial and lateral paracondylar ramps with a scalpel, scissors or cold blade. Allowing flexion to be recovered beyond 60°.
The fundamental procedure for freeing the patella was the sectioning of the medial and lateral patellar retinacula, which must be systematic in the event of a low patella or a fixed patella.
Surgical mobilization of the quadriceps most often began with a medial arthrotomy.
It can be carried out by extending the incision laterally towards the anterior superior iliac spine. (Fig. 2); which allowed the division of the patellar retinacula and the lower disinsertion of the vastus medialis.
The release of the quadriceps also associated the resection of osteomas and bone edges (Fig.2)

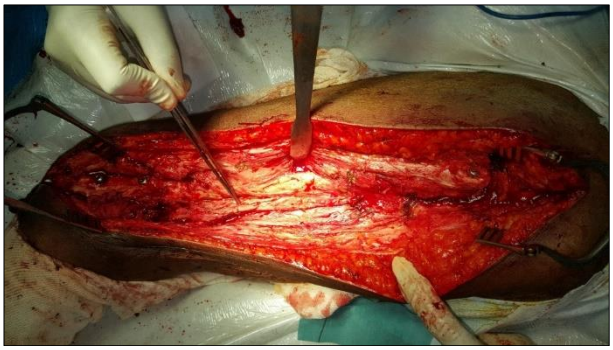

Fig 2: Exposure of the femur during surgical knee arthrolysis:

The drain was removed on day 2 (Fig.3).

Fig 3: skin closure after suction drain placement.

Post-operative care

Blood loss was estimated between 400cc and 1500cc.
Analgesia based on paracetamol 1g associated with nefopam 20mg every six hours and ketoprofen 100mg injectable every twelve hours associated with morphine as needed.
Antibiotic prophylaxis and heparinoprophylaxis were systematically initiated.

Functional rehabilitation

It starts on D0 or D1 postoperatively. An articulated orthosis is placed according to the surgeon's custom and maintains the knee at 90° (Fig.4). It was manual in the absence of an arthromotor.

Depending on the gain obtained intraoperatively, the orthosis will be modified according to the patient's pain threshold until this gain is obtained or at least close to this gain.
This is gradually modified over the course of physiotherapy sessions and according to the patient's pain tolerance.

This rehabilitation begins in hospital and continues after the patient returns home and ideally every day. In hospitalization, it was done daily.
Then, it continued an outpatient basis. The average number of sessions was 23 physiotherapy sessions carried out over an average duration of 2 months.

Fig 4: Placement of the articulated orthosis post-operatively

2.3 Evaluation method

It is based on clinical and paraclinical data, including a standard x-ray of the knee and thigh. The mobility arcs were documented using a goniometer (Fig.5).
We carry out a functional evaluation using the IKS knee and IKS function scores. Complications were also listed.

Fig 5: Postoperative clinical evaluation

The data was processed with Epidata version 3 software. The graphs were created using the Microsoft Office EXCEL spreadsheet

3. Results

Follow-up and functional assessment

The average length of hospitalization was 23.8 days with extremes of 5 to 90 days.
The average follow-up was 12.5 months with extremes between 9 and 19 months.
The average IKS knee score is 75/100 (31-88); and that IKS function was 100 in 05 patients and 50/100 in one patient with an average of 92/100 (Table II).
Five patients felt little and occasional pain. A patient felt pain when walking.

Table 2: Comparative table of IKS score and overall patient satisfaction before and after surgical knee arthrolysis.

	Preoperative	Postoperative
Knee IKS	44	75
Function IKS	53	92
Global IKS	97	167
Satisfaction	11	28

The flexion-extension gain was listed (Table III).
Only one patient had a problem with limiting the walking distance to less than 1km with asymmetrical ascent and descent of stairs. He uses a cane if he has pain when walking. Average patient satisfaction is 28/40 with extremes between 6 and 40/40 (Fig.6).

Table 3: Evaluation of the gain in flexion-extension obtained in all patients

Patients	Preoperative flexion	Post-operative flexion	Last follow-up	Preoperative extension deficit	Postoperative extensive deficit	Extension deficit at last follow-up
1	35°	90°	40°	20°	10°	10°
2	50°	90°	80°	5°	0°	0°
3	30°	90°	120°	5°	0°	0°
4	70°	120°	95°	10°	5°	5°
5	50°	95°	95°	10°	5°	5°
6	60°	120°	95°	10°	5°	5°

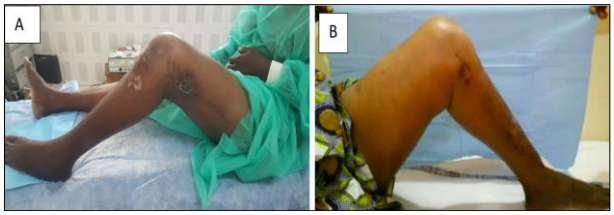

Fig 6: (A) preoperative image, (B): postoperative image of flexion of the wildebeest

Complications

A case of hypovolemic shock managed by vascular filling and a case of tearing of the anterior tibial tuberosity managed by screw fixation. A case of infectious awakening despite antibiotic therapy

4. Discussion

The sample size is quite small. This is linked to the rarity of this intervention in hospitals. However, the strength of this study lies in the fact that it is a prospective, non-randomized study; All our patients were followed up and seen again at the last check-up.

Postoperative functional assessment

The average follow-up was 12.5 months after 1 year. It was 24 months in the study by El Moutia [6]. This allows us to effectively judge the final gain obtained after the arthrolysis procedure.

Knee mobility is recovered immediately after the operation. However, this recovery also depends on the quality of the rehabilitation carried out following the operation.

Rehabilitation is essential to allow the patient to regain mobility in their knee. The number of sessions estimated at 28 sessions on average per patient at a rate of 3 physiotherapy sessions per week for at least 8 weeks.

This rehabilitation was done manually because of the technical platform.

We did not have an arthromotor available. Pain was a limiting factor in knee mobilization. In our study, preoperative pain was permanent in 2 patients and occurred when walking in 2 patients with VAS evaluated at 7/10.

Postoperatively at the last follow-up, only one patient complained of permanent pain. On the other hand, in the series [6, 9], it was permanent in 6 patients and occurred during walking in 12 patients.

Postoperatively, only 2 patients had occasional pain. The arthrolysis procedure provided undeniable relief to patients.

In terms of mobility, and compared to the El Moutia series, the average knee flexion was improved, going from 49° to 87.5° respectively post-operatively; and from 95° to 87.5°. and from 95° to 111.4° postoperatively

This positive result shows that it is an effective technique in the management of stiffness.

Whatever the series [4, 7, 8]. IKS scores improved after surgical arthrolysis. The average knee IKS score was 44 preoperatively and 75 at final follow-up. In El Moutia's study, it was 49 preoperatively and 92 at final follow-up.

The average IKS function score was 53 preoperatively, and 92 at final follow-up. It was 49 preoperatively and 72 at final follow-up in the EL Moutia study.

This excellent result shows that surgical knee arthrolysis when it is well practiced with good postoperative functional rehabilitation, it makes it possible to improve both the flexion and extension of the knee as well as the socio-professional activities of the patient. It thus improves the patient's quality of life.

This objective result was confirmed by patient satisfaction which increased from 11/40 preoperatively to 28/40 at final follow-up.

Length of hospitalization

The average length of hospitalization was 23.8 days. It is 13 days in the study of [9] and 5 days in the study [6].

This reduced length of hospitalization was due to the fact that some patients treated had bone lesions and soft tissue affecting other bone segments. Furthermore, hospital treatment of bone infection also contributed to extending the length of hospitalization.

Stiffness in knee flexion and extension

In our study, we had 5 cases of stiffness in flexion which represented 83%. Unlike the study by El Moutia [6] in which the combined stiffness represented 73%. Mild knee flexion had no impact on knee function, unlike limitation of flexion [10].

Severity and duration of stiffness

50% of stiffness was very severe and severe. The average duration of stiffness was 7 months, ranging from 2 months to 37 months.

This relatively high rate is mainly due to the delay in treatment. The treatment is conditioned by the socio-economic means which were unfavorable in our patients.

Complications

In some cases, complications of knee arthrolysis may require a new operation such as infection for which a re-operation allows cleaning of the wound.

In our study, we had three complications. It was 15% according to certain authors [3, 7]. This low rate is linked to the smallness of our sample. The recurrence was linked to the persistence of the infection in one patient.

5. Conclusion

Open surgical arthrolysis or the great release of Judet is a safe and effective technique in the management of knee stiffness. It helps improve the quality of life of patients by increasing knee mobility and thus facilitating certain movements in daily life. Given the unsightly and extensive nature of post-operative scars, early management of stiffness by physiotherapy will be desirable. At best, we can improve the technical platform. This would allow us to treat certain stiffness arthroscopically.

Conflicts of interest: None

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