UEMS PRM Section & Board

Clinical Affairs Committee

New accreditation procedure

Programme n°1

PRM follow up after ACL reconstruction

Prog001_ACL_follow_up20101120accredited.doc

Issue

Version: 2.2

Date of the first version: 26/01/2010

Date of the present version: 20/11/2010

Final comments of the Clinical Affairs Committee

The programme fits the European accreditation standards. But, the author is invited to update references and assessment in the future.

Contents:

I. Identifying data

Title	Dr
Family name	DE KORVIN
First name	Georges
Position	PRM Specialist in private practice
Phone	0033 223 25 39 90
Email	gdekorvin@free.fr
Year of Board Certification	2007
Name of unit	Orthopédie et Réadaptation
Hospital (facility)	Centre Hospitalier Privé Saint-Grégoire
Address	
Post code	35768
City	SAINT GREGOIRE
Country	France

II. Summary

The knee cruciate ligament reconstruction is discussed and performed in the perspective a functional goal: restoring a stable knee, which is necessary to let the patient resuming a series of daily, professional and sports activities. But the ligament replacement is not sufficient to reach this goal. The overall success of the procedure is also based on a safe and steady functional progression of the patient.

Since 1998, two similar PRM programmes of care have been run in Nantes and in Rennes, in order to follow up outpatients after ACL reconstruction. Their general goal is to optimize the post-surgical recovery in community conditions, for all patients after ACL reconstruction. This means:

- To detect and to manage, as early as possible, any complication or mismanagement of the operated knee.
- To supervise the rehabilitation process, i.e. to give advices to the physiotherapist and to coach the patient's self training.
- To assess the patient's functional progress in terms of pain and swelling decrease, passive stability, range of motion and muscle strength, until we decide that he/she has met the conditions for resuming pivot activities with reasonable safety.

The rehabilitation procedure has been divided into three main phase:

- Rehabilitation to daily activities, from D8 to D60.
- Progressive effort training, from D60 to D 120
- Training to sports resumption, D120 to D360.

For main PRM assessments are scheduled during this process, 3 weeks, 2 months, 3-4 months and 6-8 months after surgery. An isokinetic dynamometer assessment is usually performed within the third and the fourth assessment and a joint examination with the surgeon is commonly organized at M3 or M4.

This programme has obviously been appreciated by patients and surgeon partners, whose number has increased from one to four. Complications, such as regional pain have dramatically decreased and the physiotherapists' habits have been harmonized and improved in our area.

Isokinetic dynamometry assessment has proved to be a powerful mean to improve the level of muscle strengthening and the commitment of patients to their self training. Outdoor cycling has appeared to be the most efficient exercise to reach the basic functional level required to resume easy running and sports activities with pivot strains.

Our programme in Rennes, together with Dr Bertrand Rousseau's similar programme in Nantes, has obtained a National recognition, becoming the basis for funding negotiations between the French PRM Union (SYFMER) and the National Health Insurance and for professional practice recommendations issued by the French PRM Society (SOFMER).

III. General foundations of the Programme

A. PATHOLOGICAL AND IMPAIRMENT CONSIDERATIONS [1]

1. Aetiology

Ruptures of the Anterior Cruciate Ligament (ACL) of the knee can result from different **forced movements:** flexum-valgum-external twisting, varus & internal twisting, sudden hyperextension or hyperflexion. This is frequent with sportsmen, especially football, handball or basket ball players, and skiers. It can also occur in professional or daily activities. ACL rupture may be isolated or associated with peripheral lesions, such as internal or external ligament tears, meniscus tear and bone bruises.

2. Natural history and relationship to impairment

Most of those peripheral lesions can heal up with a conservative treatment. Meniscus tears are preserved as far as possible and only instable lesions are treated by arthroscopic approach separately or along with the ACL reconstruction.

The ACL plays a prime role in the stability of the knee, especially in twisting movements. However some compensations may be obtained, thanks to the active protection by the muscles. Many people can expect a normal daily activity and practice sports without rotation. Some very well trained sportsmen can even practice pivot sports, such as soccer, when their proprioception and their muscle control is good enough to ensure an active stability of the knee.

Impairment consists of the instability of the knee, which mainly occurs in twisting movements, on landing after a jump, sometimes simply on walking and turning to a different direction. Instability is mainly linked to the ACL rupture, but is also maximized by peripheral lesions, meniscectomy and misalignment of the lower limb.

3. Medical diagnosis and prognosis

Impairment: the diagnosis of ACL rupture is mainly based on the *Lachman Test*, which demonstrates the anterior-posterior laxity.

MRI should not be necessary to make the diagnostic of ACL rupture, but is mainly used for the diagnosis of peripheral lesions. However, it can reveal an incomplete rupture, which may heal up spontaneously.

Activity limitation: potential instability of the knee is also demonstrated by clinical tests, such as the Jerk Test.

Participation limitation: the knee laxity can be well tolerated for a rather long time by people who have a quiet way of life. However, after several years without significant discomfort, new episodes of instability are likely to occur, even in daily activities. A vicious circle may take place between the instability of the knee and a secondary damage of the peripheral components of the knee, especially meniscus and cartilage.

Falling hazard may alter participation capacities, not only in sports practice, but also in professional and daily activities. Prolonged instability is a factor of early arthritis.

4. Treatments

a) Immediate care

Except for severe and complex lesions of the knee, the surgical is not decided immediately after the accident. During four to six weeks, the knee is protected by an orthosis, and a light physiotherapy can be started. During this period, most of the peripheral lesions will heal up and the therapeutic strategy is decided on the basis of activity limitations (i.e., instability) and participation expectations (i.e., sports with twisting movements, working in dangerous conditions).

b) Conservative treatment

The conservative treatment is based on muscle strengthening and kinaesthetic training. It is proposed to most of the patients as a primary approach.

c) Surgical treatment

In our hospital, patellar tendon autograft and hamstring tendon autograft are commonly used by surgeons, according to their personal experience. Few differences have been noticed between both techniques.

Indications are decided in accordance with the Guidelines issued by the French High Authority for Health. In France, about 20 000 ACL reconstructions are performed every year.

Except for very severe injuries of the knee, surgical treatment is indicated in two main conditions:

- For sportsmen (women) who want to resume his/her practice with a stable knee and fo r people working in risky conditions. For any patient who have experienced secondary accidents due to instability, and who are hindered in their activities.
- Surgery is usually performed at least one month after the initial injury, when peripheral lesions have healed up, swelling and pain have disappeared and motion has returned to a normal range. Muscles can be strengthened, mainly by regular cycling and crawl swimming previously to the operation.

B. ACTIVITY LIMITATIONS AND PARTICIPATION RESTRICTIONS

Some sportsmen are able to control their instability, thanks to a very active training resume hazardous sports practice, such as soccer, after a tough training.

Ordinary people are advised to practice sports without rotation, such as cycling, jogging, rambling and swimming and to come back to the surgeon if ever they start suffering from new instability incidents and/or from pain and/or swelling of the knee.

Falling hazards are the immediate consequence of instability, with further damage to the knee, but also more serious injuries to other parts of the body (e.g.,. a carpenter falling from a roof).

Therefore, ACL reconstruction decision is tightly linked to activity limitations and participation restrictions (or expectations) :

- People who want to resume sports or works with frequent twisting constraints of the knee, and moreover if their working conditions are dangerous;
- People who suffer from instability episodes in their usual activities.

C. SOCIAL AND ECONOMIC CONSEQUENCES

1. Epidemiological data

According to national statistics from the Ministry of Health and from the National Health Insurance, 35 000 patients were operated in 2006 for an ACL reconstruction and 2 000 more patients were operated for a Posterior Cruciate Ligament reconstruction or for combined lesions.

2. Social data

Aside the temporary limitation of sports and leisure activities, ACL reconstruction implies a break in professional activities, usually ranging from one to six months, with regard to the healing process, the functional recovery and the professional or sports constraints.

3. Economic data

The health system in France is based on the following principles:

- Direct access to surgeons and specialists is allowed but the financing rules foster a better cooperation with the “referent General Practitioner” of the patient, who has to be regularly informed.
- Informed consent of the patient is mandatory.
- Caring people without health insurance is mandatory. People who cannot pay for the regular National Health Insurance can take benefit from Governmental Assistance, which pay for their medical expenses on the basis of regulated fees. Charging them extra fees or refusing them normal health care is strictly prohibited.
- During hospitalization, most of the expenses are directly paid by the National Health Insurance. There is a trend to go back home 5 days after surgery. Rehab services are full with “heavy patients”
- In community care, patients pay for consultations, drugs, examinations and physiotherapy and they are then reimbursed by the National Health Insurance and additional private insurances.
- Medical fees are regulated and the possibility to charge extra fees is limited.

D. MAIN PRINCIPLES OF YOUR PROGRAMME [2, 3, 4]

1. Biological progression of the autograft

The autograft is an inert component, since it has been deprived from its vascularisation and innervation. Its initial resistance is sufficient for careful walking with crutches, without any bracing. A biological process, called “ligamentization” will integrate the autograft to the joint. Studies in animals have shown a necrosis phase followed by a new colonisation by living cells. Therefore, the graft was supposed to be weaker between Month 2 and Month 4 after surgery.

Nevertheless, this necrotic phase has not been found in humans. On the opposite, living fibroblasts have been observed as early as the third week after surgery. Rougraff and Shelbourne described a ligamentization process in four phases:

- Phase 1: cellular colonization, during the two first months,
- Phase 2: collagen remodelling (Month 2 to one year) : important fibroblastic activity and neovascularisation, together with degenerative zones.
- Phase 3: maturation (1-3 years) : decrease of cells and vascularisation, maturation of the collagen fibres.

- Phase 4: quiescence: three years after the reconstruction, autografts present a real ligament structure, similar to a normal ACL.

In our practice, we consider that:

- The autograft is strong enough to allow immediate full bearing on the operated knee and a free active motion within the limits of pain. Stress forces are low, except at both ends of the range of motion.
- Autograft resistance becomes sufficient to allow pivot strain activities *6 months after surgery*. This is considered as a safety deadline, but this is not the only condition for resuming such activities! We know that other medical teams allow professional sportsmen/women to resume their practice earlier, but most of our patients are leisure sportsmen/women and taking more risks with their knee doesn't seem reasonable.

The autograft structure will also be remodelled:

- The autograft is a simple ribbon with parallel fibres, whereas a natural ACL has a spiral structure, which helps coping with the complex kinematics of the knee. Therefore, extreme extension and flexion may be somewhat limited during the first months.
- The gain of motion will be obtained by the swelling regression and by swinging and cycling activities, leading to a gentle remodelling rather than by aggressive postures, which lead to a painful and swelling knee and may alter the autograft. In our experience, motion can improve continuously more than one year after surgery.

Elastic fibres don't regenerate. The autograft elasticity will ever remain worse than in a natural ACL. But, this has few practical consequences.

Forced postures are harmful, especially during the first three months: they keep the knee swelling and remaining painful. This may favour a Complex Regional Pain syndrome and a stiff knee. Either, postures can loosen the autograft and limit the benefit of the intervention on knee stability.

2. Inflammatory regression

Swelling and pain usually decrease within the first two months. They take part in the limitation of the range of motion and it is useless to impose stressful training until they have disappeared.

Natural means, such as icing, bathing and gentle cycling, help to reduce swelling and pain. Early jogging with a swelling knee has proved to be useless and to maintain the swelling condition for a longer period of time. In the same way, it is difficult to improve the muscle strength, so long as the knee remains swollen.

3. Active stability

Ligaments are featured to guide the complex kinematics of the knee, but not to resist to sudden and major strains. This is up to muscles, which need to be strong and reactive enough to protect the knee in any situation.

Therefore, **muscle strengthening** is a key issue for the future safety of the knee and assessment by isokinetic dynamometers takes an important place in our follow up strategy.

Proprioception: the ACL provides very important kinaesthetic information for the knee active control. The ACL autograft has lost its nervous connexions. Therefore, the patient will have to learn how to better use peripheral kinaesthetic information through his/her training practice.

4. Complications after surgery [3, 4]

Post-operative complications are scarce but need to be detected and managed as early as possible. Infection (<5%), which can appear distantly after the operation, phlebitis and

pulmonary embolism (1%), Regional Pain Syndrome (5%) and stiffness of the knee, autograft necrosis (2%) and early rupture (5%) have been reported in the literature.

IV. Aims and goals of the Programme

A. TARGET POPULATION

1. *Inclusion/exclusion criteria*

This PRM Programme applies to all patients, who have undergone an ACL reconstruction in our private hospital, where four different are specialized in knee surgery.

2. *Referral of patients*

Direct access to the PRM programme	No
Referral from general practitioners	No
Referral from other specialists	Yes
Referral from specialists in PRM	No

Patients are informed about our programme by the knee surgeons. They keep the choice of being followed up by another physician (e.g., when they live in remote places), or to take benefit from our follow up programme.

There General Practitioner is informed, initially by the surgeons, then by the PRM doctor, throughout the programme.

3. *Stage of recovery*

Within two weeks of onset	No
2 weeks to 3 months after onset	Yes
3 months or longer after onset	Yes

Immediately after the surgical intervention, patients are directly supervised by their surgeon, in cooperation with an anaesthesiologist and a physiotherapist. Pain relief, phlebitis prevention, early active movement and walking are the rule during this period. On Day 5 most of the patients leave the surgical unit and go back home.

The surgeon gives them a prescription for physiotherapy sessions, three times a week in a private practice close to their home, and some advices for self training exercises. A first appointment with the PRM Specialist is scheduled, 3 weeks after operation.

B. GOALS OF THE PROGRAMME

The general goal of the programme is to optimize the post-surgical recovery in community conditions, for all patients after ACL reconstruction. This means:

- To detect and to manage, as early as possible, any complication or mismanagement of the operated knee.
- To supervise the rehabilitation process, i.e. to give advices to the physiotherapist and to coach the patient's self training.
- To assess the patient's functional progress in terms of pain and swelling decrease, passive stability, range of motion and muscle strength, until we decide that he/she has met the conditions for resuming pivot activities with reasonable safety.

1. In terms of body structure and function

ICF code	ICF label
s75011	**Knee joint**
b7150	**Stability of a single joint - Functions of the maintenance of structural integrity of one joint.**
b7100	Mobility of a single joint - Functions of the range and ease of movement of one joint.
b7303	Power of muscles in lower half of the body Functions related to the force generated by the contraction of the muscles and muscle groups found in the lower half of the body.
b7401	Endurance of muscle groups Functions related to sustaining muscle contraction of isolated muscle groups for the required period of time.

The programme aims:

- To detect any complications: infection, phlebitis, Regional Pain Syndrome, stiffness, persistent swelling, meniscus tears, early rupture.
- To restore a dry and painless knee with good mobility, strength and active stability, in order to let the patient to resume his/her activities with the minimum risk of a repeated injury.

2. In terms of activity

ICF code	ICF label
d4502	Walking on different surfaces - Walking on sloping, uneven, or moving surfaces, such as on grass, gravel or ice and snow, or walking aboard a ship, train or other vehicle.
d4552	Running - Moving with quick steps so that both feet may be simultaneously off the ground.
d4553	Jumping - Moving up off the ground by bending and extending the legs, such as jumping on one foot, hopping, skipping and jumping or diving into water.
d4558	Moving around, other specified : activities with pivot strains

The main goals are:

- To resume normal walking on any kind of ground,
- To walk up and downstairs,
- Then to run,
- And finally to resume activities with pivot strains.

3. In terms of participation

ICF code	ICF label
d699	Domestic life, unspecified
d8509	Remunerative employment, unspecified
d9201	Sports - Engaging in competitive and informal or formally organized games or athletic events, performed alone or in a group, such as bowling, gymnastics or soccer.

The main goals are:

- To resume daily and professional activities, then sports practice,
- With the lowest risk as possible to suffer from a repeated homo lateral strain (with auto graft rupture or meniscus tears), or from a similar accident on the contro lateral knee, which may be caused in similar conditions as the first one.

V. Environment of the programme

A. CLINICAL SETTING

Individual practice or part of a doctor's group practice	No
Individual practice in a private hospital	Yes
Part of a local (public) hospital	No
Part of a regional hospital (or rehabilitation centre)	No
Part of a university or national hospital	No

This programme is carried out in a Private PRM Practice, inside the walls of a Private Surgical Hospital. The PRM office is located in a building devoted to outpatient consultations, on the same floor as surgeons' offices and a private physiotherapists' facility.

Nevertheless, great deals of the patients, who are followed up in our programme, carry out their rehabilitation with community based physiotherapists, closer to their home.

B. CLINICAL PROGRAMME

Inpatients in beds under PRM responsibility	No
Inpatient beds belonging to other departments	No
Day programme (most of the day in outpatient setting, not home)	No
Outpatient clinic (assessment and/or treatment, for up to 3 hours/day)	Yes
Community based (in the patient's home or workplace or other relevant community location, eg sports centre)	Yes

The medical supervision of patients is performed on the basis of medical specialist consultations.

The physiotherapists' facility, located inside our walls, has the same status as any private physiotherapist's office located in the community.

C. CLINICAL APPROACH

Uniprofessional	No
Multiprofessional	Yes

See details in chapter VIII B.

D. FACILITIES

Does your programme have a designated space for :	
For assessments and consultations?	Yes
For an ambulatory or day care programme?	Yes
For inpatient beds?	No
For therapeutic exercises?	Yes
For training in independence and daily living?	No
For vocational and/or recreational activities?	No

The physiotherapist's facility beside our consultation rooms is equipped with:

- A 80 m² room for different kinds of exercises and effort training.
- A series of small rooms for individual massage and physical therapies, mainly ultrasound and electrotherapy.
- A pool for walking and other exercises in the standing position.

Patients are free to decide to take benefit of this facility for their rehabilitation or to go to another physiotherapist's office. We recommend them to choose a physiotherapist who may offer a similar standard of equipment. The rehabilitation pool can be very useful in some circumstances but is not mandatory.

VI. Safety and patient rights

A. SAFETY

The safety concerns of persons in the unit where the programme takes place, relate to :	
Emergencies (fire, assault, escape)	Yes
Medical emergencies	Yes
Equipment	Yes
Handling of materials	Yes
Transports	No
The safety of persons in the programmes of your unit is provided by :	
Written standards from National Safety Bodies	Yes
Written standards from National Medical Bodies	Yes
Unit-specific written rules	Yes
Periodic inspection	
Internal	Yes
External	No

The office is equipped with a rescue trolley, including a emergency wallet, a heart defibrillator and a respiratory assistance device. This equipment is inspected once a year.

The facility and its equipment fit the Recommendations for Private PRM Offices, issued in 2002 by the French Professional Union (SYFMER), in cooperation with the National Health Insurrance (CNAMTS). [5] .

B. PATIENT RIGHTS

Has your programme adopted a formal policy or statement of patients' rights?	Yes
Does this statement specify the influence that the patient should have in the formulation and implementation of the programme?	Yes
Is the statement known to all personnel involved in delivering the programme?	Yes
Is this checked periodically?	Yes
Is the statement made known to and is available to all persons visiting your unit?	Yes

Before and during their hospitalization in the surgical unit, a leaflet is given to each patient, informing him/her of his/her legal rights. Similar information is displayed on posters in different parts of the hospital. This information is mandatory.

In the consulting area, mandatory information is displayed about the qualification of each physician, on his usual fees and on reimbursement conditions.

Before surgery, patients are informed of the benefits and risks by the surgeon and they sign a consent form, in accordance with the French law.

At the end of the first PRM consultation, we give to the patient a leaflet with the following information:

- Short reminder about the ACL function and the reconstruction procedure,
- The phases of the rehabilitation procedure,
- The scheduled consultations and assessments,
- The self-training exercises,
- Some advices for the physiotherapist
- Some advices which will be useful when resuming sports activities.

C. ADVOCACY

Give at least one example of how your organisation advocates for people your programme deals with:
Free CME/CPD sessions for physicians and physiotherapist
Free website www.orthopedie-et-readaptation.com
Free website www.gral.fr

Together with the team of surgeons, we have set up a CME/CPD non profit organization, namely the "Groupement Rennais de l'Appareil Locomoteur (GRAL)". We organize an evening meeting every month and a half day meeting every year.

The audience is mainly composed of general practitioners, rheumatologists and physiotherapists interested in our activities and programmes of care. Registration to the meetings is free. During these meetings, we try to share our experience and to inform the participants the best way to cooperate with us, in order to improve the service offered to the patients.

Two websites have been set up for public and professional free information:

- www.orthopedie-et-readaptation.com provides information about PRM topics and procedures.
- www.gral.fr is more focused on surgical issues.

VII. PRM Specialists and team management

A. PRM Specialists in the Programme

Does your PRM physician have overall responsibility and direction of the multiprofessionnal team?	Yes
Does your PRM physician have overall responsibility and direction of the rehabilitation programme, not only medical responsibility?	Yes
Does he/she have a European Board Certification in PRM ?	Yes
Does he/she meet National or European CME/CPD Requirements?	Yes
Number of CME or EACCME points earned in the last 3 years :	
The *two primary functions* for the PRM specialist in your Programme are to :	
Treat comorbidity	No
Assess the rehabilitation potential of the patient	Yes
Analyse & treat impairments	No
Coordinate interprofessional teams	Yes

The PRM Specialist coordinates the programme and carries out a series of assessments, which are scheduled on key-dates in the usual post-operative follow up. He also responds to any urgent patient's request. He regularly informs the surgeon of his statements and advises him immediately whenever a complication has been detected

The PRM Specialist prescribes and supervises physiotherapy as well as any other additional examination or treatment (biology, imaging, orthotic devices, etc.) related to the ACL reconstruction. Furthermore, he issues recommendations about the duration of the working break and about the resumption of hazardous physical activities.

Whenever co-morbidity is detected, the PRM Specialist informs the patient's General Practitioner and it is up to the latter to deal with that issue, unless there is a real emergency requiring an immediate treatment.

B. Team management

Which rehabilitation professionals work on a regular basis (minimum of once every week) in your programme? (give the number)	
Physiotherapists	No limit
Orthotists/prosthetists assistive technicians/engineers	3
Other (please specify)	
How often does your staff receive formal continuing education (mark as is) ?	
In team rehabilitation :	Other period

In their own profession :	Other period
Do team activities in your rehabilitation programme include the following?	
Is the patient at the centre of a multiprofessional approach?	Yes
Do you always give informed choices of treatment?	Yes
Do you regularly promote family involvement?	Yes
Does your organisation of multi professional team working include :	
Holding regular team meetings with patient's records only (more than 2 members)	No
Holding regular team meetings (more than 2 members) with the presence of the patients	No
Joint assessment of the patient or joint intervention	Yes
Regular exchanges of information between team members	Yes

Participants in the programme are:

- **The surgeon:** he supervises the first week after surgery and reviews the patient, either systematically, several months later, or in case of a complication which may need his intervention.
- **The PRM specialist:** his intervention is announced and explained by the surgeon to the patient before the operation. The PRM doctor supervises the rehabilitation programme and he reviews the patient at several key-dates of the post-operative follow up. He also deals with urgent requests of the patient and he informs the surgeon of any detected complication. The PRM doctor prescribes and supervises physiotherapy, wherever this physiotherapy is performed. If necessary, he asks for additional studies and/or care required by the status of the patient (biology, imaging, orthoses...). He issues recommendations about the duration of the working break and the resumption of hazardous activities.
- **Anaesthesiologists** deal with immediate regional analgesia after surgery. They can also be required to perform regional blocks in case of a regional pain syndrome, several weeks after the operation.
- **The General Practitioner** (GP) is informed of each patient's functional evolution, as reported by the PRM doctor after each follow up consultation. However, he may be the first to cope with any emergency and he keeps on dealing as usual with health problems which are not related to the ACL reconstruction. When the PRM doctor detects an unknown illness, he informs the GP of his findings and let him deal with this issue.
- **The Physiotherapist** is chosen by the patient himself/herself, with respect to his/her proximity and/or to his/her equipment and skills. The first physiotherapy sessions can be performed at the patient's home. As soon as the patient becomes able to move independently, sessions at the physiotherapist's office are recommended.
- **Orthotists** from three different private orthopaedic companies cooperate with us whenever an orthosis is required. Moulding of the limb and adaptation of the orthosis on the patient is performed under our immediate control.

VIII. Description of the programme

A. TIMEFRAME OF THE PROGRAMME

1. Phases of the programme

The programme is consists of three phases

a) D8-D60: rehabilitation to daily activities.

The expectations are:

- A nearly dry and painless knee, a range of motion of 0/120° and the capability to stand on one foot with a flexed knee,
- The ability to independent walking, up and downstairs, squatting and cycling,
- The return to work, when constraints are assessed as mild or fare (see below) and the knee is considered as dry and painless enough.

b) D60-120: effort training.

The expectations are:

- A dry and painless knee, with a good passive stability and a mobility of 0/130°, monopodal flexion 80°, hop test easily performed.
- The ability to outdoor cycling (15/25 km), crawling, reasonable rambling.
- The return to work in most cases (except for “dangerous constraints”)

c) D120-D360: training to sports resumption.

The expectations are:

- Progressive return to “normal” conditions,
- Nevertheless, we have to make a difference between the “safety deadline” of 6 months (before resuming twisting activities) and the optimal recovery period, which is often more than one year.
- The patient will progressively resume jogging, jumping and then, “technical sports activities” and risky jobs.

2. Follow up procedure

The PRM follow up procedure consists of **four main consultations:**

a) 3 weeks after surgery: clinical assessment

- Assessment of pain, swelling, mobility, muscle contraction; complications detection
- Demonstration of self-rehabilitation exercises
- Detailed prescription for the physiotherapist
- Discussing the perspectives of return to work

b) 2 months after surgery: clinical assessment + dynamic X-ray

- Functional progression or delay

- Anatomical stability assessment : Lachman and Jerk tests + dynamic X-ray
- Starting outdoor cycling and swimming.

c) 3-4 months after surgery : clinical and isokinetic assessment

- Joint examination together with the surgeon.
- Running is discussed according to clinical and isokinetic data.

d) 6-8 months after surgery: second clinical and isokinetic assessment

- Resuming twisting activities is discussed
- If the requested performances have not been reached yet, we discuss the possible causes and the best ways to achieve a full functional recovery.

e) Additional follow up is carried out for patients with complications or delayed recovery

B. ASSESSMENT

1. Diagnosis (related to ICD)

The clinical examination mainly focuses on:

- The knee and lower limb status: pain, swelling, range of motion, muscle atrophy.
- The absence of laxity is checked by the Lachman test and by dynamic X-rays, the latter being performed two months after surgery.
- The detection of complications: cutaneous healing troubles, infection, phlebitis, complex regional pain syndrome, instability of meniscus tears, rupture of the auto-graft, secondary damage on the patella or patellar tendon.

Ultrasound and Doppler are immediately performed whenever there is a suspicion of late phlebitis.

Additional imaging is prescribed when there is a serious suspicion of a secondary damage of the knee.

2. Activity

The **range of motion** is measured from the standing position to the squatting position.

Balance control and muscle strength is assessed by flexing the knee on one leg and a comparative hop test.

Passive stability is assessed by the Jerk test (together with the Lachman test, which assesses the laxity).

Muscle strength is systematically assessed by **isokinetic dynamometer,** 3-4 months after surgery and 6-8 months after surgery [6, 7, 8, 9]. This instrumental assessment provides objective information on:

- The maximum torso delivered by extensor and flexor muscles
- The aspect of torso curves: either round and regular, or with some notches or plateaus.
- The muscle endurance, with respect to the steadiness or the decrease of strength throughout the series of movements.

3. Participation - environmental and personal factors

a) Home environment

Obstacles to go straight back home from the hospital after an ACL reconstruction are scarce and have usually been assessed before surgery.

b) Working conditions

Together with the knee functional status, the working conditions determine the duration of the working break. In our practice, we usually consider four levels of professional constraints on the knee:

- **Mild constraints:** working in a seating position, neither long walking distance nor long driving, from home to office included (e.g., clerk, computer engineer).
- **Fare constraints:** need to keep on standing for long periods of time, either to repeatedly walk most of the day (supermarket selling agent, travelling businessman, some craftsmen)
- **Heavy constraints:** full time standing position required (e.g., plant worker on a production line, handler, long distance lorry driver, building and public works employees).
- **Dangerous constraints:** working on slippery or unstable ground (e.g., a lorry driver who has to wash out a milk tank every day, firemen, soldiers), either on an elevated position (e.g., carpenter). Here, there is a risk of repeated rupture of the autograft and, for the latter, a falling hazard with a risk of death.

c) Sports and leisure

On each consultation, the patient is invited to give details about his training activities, with a special focus on walking upstairs and downstairs, then cycling and swimming, and running at last. Attention is paid to the intensity and duration of those activities, his easiness, and absence of pain and/or swelling of the knee during or after their practice.

The patient is also questioned about his leisure and sports projects, especially on his wish to resume activities with pivot strains on the knee.

C. INTERVENTION

1. PRM specialist intervention

See above (PRM follow up) and below (complication management)

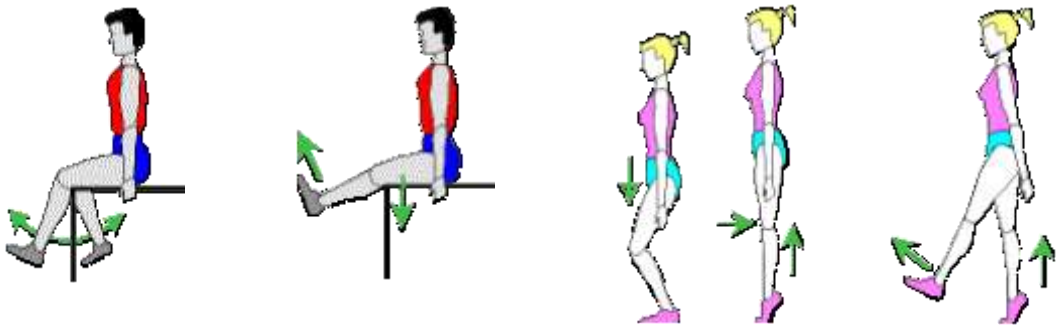
2. Team intervention - rehabilitation

a) Phase 1

Physiotherapy consists of massage, isometric contractions, assisted mobilisation and progressive muscle strengthening, first in closed kinetic chain, then in open kinetic chain.

Self-training exercises are demonstrated by the PRM doctor during the first consultation:

- In lying position: raising the stretched leg, then relaxing (10 times)
- In seated position: relaxed swinging of the leg in seated, then active swinging. The thigh should press down the seat during the leg extension.
- In standing position: 1) knee flexion, then knee and feet extension; 2) walking with heels up at the end of the stride.



Beware that the "swinging exercises" demonstrated here should not be confused with "strengthening exercises" performed in "open kinetic chain". Here, no resistance is applied and constraints on the knee are very low. These exercises must be painless and relaxing.

b) Phase 2

Physiotherapy: muscle strengthening becomes more intensive. Forced postures are avoided.

Self-training: outdoor cycling has appeared to be the most important factor of strength and general recovery. We recommend to cycle at least once a week on progressive distances and difficulties, up to 20-25 km. Swimming (crawling) is useful too. Early running has proved to be useless and sometimes harmful.

c) Phase 3

Self-training with outdoor activities becomes the most important factor of improvement

The conditions for starting running are :

- A dry and painless knee, with good mobility
- Strength deficit less than 40% on extensors at the isokinetic assessment

3. Complications management

a) Phlebitis

Any suspicion of phlebitis triggers an immediate echo-doppler control. If positive, a curative treatment is started without delay.

b) Complications requiring the surgeon's intervention are scarce, but may be:

- Post-operative infection (usually detected much earlier than our control).
- Autograft rupture
- Unstable meniscus tear
- Rupture of the Extensor system (exceptional)
- Insufficient stabilisation, favoured by a postero lateral laxity and a genu varum.

c) Complications requiring a functional treatment are much more common

Prolonged swelling can be caused by a non resorbed haematoma or, more often, to an inflammatory reaction favoured by aggressive flexed postures or any other kind of overuse of the knee. In most cases, icing, balneotherapy and a gentle adaptation of physiotherapy and training will help the knee to become dry and painless. When those measures, plus a

prescription of antiinflamatory drugs are not able to solve this trouble, a simple puncture will evacuate a liquid which often contains microscopic fragments. Recurrent swelling is exceptional, unless the knee already suffers from early arthritic damage.

Pain and stiffness may be the symptoms of a Complex Regional Pain Syndrome (CRPS). Prevention by avoiding any forced posture and aggressive physiotherapy has proved to dramatically reduce the frequency of CRPS. In exceptional cases (once a year), we cooperate with anaesthesiologists who perform regional anesthetic blocs during a short hospitalisation.

Persisting flexed knee over 10°, two months after surgery can be treated by very progressive night postures, using a special orthosis. These postures aim to help a remodelling of the soft tissues rather than stretching them out, as heavy postures during physiotherapy sessions may try to do it. This has to be carefully explained to the patient and checked every month. Of course, an active muscle strengthening is carried on every day. In these conditions, the patient can expect a gain of 5 to 10° per month. Knee flexion usually progresses by the same time. Therefore, we nearly never need to perform arthroscopic interventions to treat the so called “Cyclops syndrome).

A “patella pain” syndrome can be easily demonstrated by the isokinetic dynamometer curves, when they show a typical notch or a plateau, especially at low angular velocity. These abnormalities often disappear at higher velocity. As a consequence, the patient is advised to adapt his training, to avoid working against heavy charges at low speed, to reduce or stop running for a period of time and to practice regular cycling, which is better tolerated and helps to harmonise the muscle balance.

Muscle tears after Semi Tendinosus – Semi Membranosus tendon removal are somewhat frequent, but with benign consequences.

D. DISCHARGE PLANNING AND LONG TERM FOLLOW UP

The follow up is fully achieved when the following criteria have been reached :

- No swelling and no pain;
- No passive instability. In case of a persistent laxity and instability, the surgeon opinion is always required;
- Good range of motion. The patient is advised that recurvatum is not a rehabilitation goal and that flexion can still improve during more than one year after surgery.
- Good muscle strength: extensors deficit less than 20% and flexors deficit less than 10 %

We don’t perform specific tests to specifically assess proprioception, but it seems that this criterion is rather well correlated with the overall functional improvement of the patient.

Proprioceptive performances as well as other functional parameters are expected to keep on improving with a progressive, regular and various training, which is systematically recommended before resuming any risky or competitive sports activity.

IX. Information management

A. PATIENT RECORDS

Do the rehabilitation records have a designated space within the medical files?	Yes
Do you have written criteria for :	
• Admission	Yes
• Discharge	Yes
Do your rehabilitation plans include written information about aims and goals, time frames and identification of responsible team members?	Yes
Do you produce a formal discharge report (summary) about each patient?	Yes

All the patients' data are recorded in a special medical database, which has been registered to the Commission Nationale Informatique et Liberté (CNIL - National Freedom and Computing Committee).

After each consultation, a printed report is immediately given to the patient, who can ask for any correction or even deletion of his information in the database. With the patient's agreement, a copy is sent to his referent GP and to his surgeon.

The discharge report is similar to the other consultations reports. Usually, the "end of PRM follow up" is mentioned in this last report. No systematic long term follow up has been organized yet.

B. MANAGEMENT INFORMATION

Does your programme show evidence of sustainability?	
• Established part of public service :	No
• Has existed for more than 3 years :	Yes
• Has received national accreditation (where available) :	No
How many new patients (registered for the first time) are treated in your programme each year :	**…**
In your day care or inpatient programme :	
• What is the mean duration spent in therapy by patients on this programme	Non applicable
• How many hours a day do the patients spend in therapy.	Non applicable
Give the mean duration of stay spent in the programme :	6-8 months

Our programme results from an original private initiative and was started in 1997, as the answer to an orthopaedic knee surgeon's demand. Since then, three additional knee surgeons have asked to accept their operated patients into our programme. No major reason has been raised to change the principles and features of this programme.

Our programme in Rennes and Dr Bertrand ROUSSEAU's similar programme in Nantes, have been both **recognized by the French PRM Union (SYFMER) and the National Health Insurance** as a good model in the negotiations about the reimbursement of Isokinetic Dynamometry within the follow up of patients after knee ligament reconstructions.

Both programmes have also been **used by the French Scientific Society (SOFMER) as starting documents for setting up National Recommendations** for the follow up of patients after knee ligament reconstructions [9].

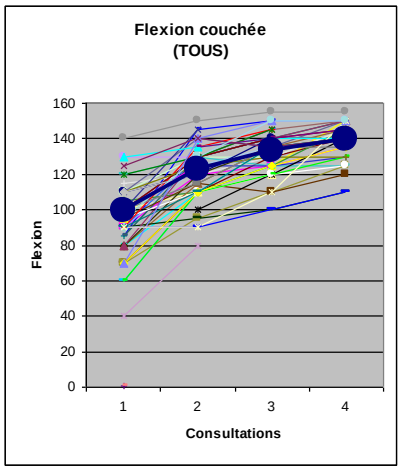
C. PROGRAMME MONITORING AND OUTCOMES

Does your programme have an overall monitoring system in addition to patient's records ?	No
Are the long term outcomes of patients who have completed your programme regularly monitored ?	
• Impairment (medical) outcomes :	No
• Activity/Participation (ICF) outcomes :	No
• Duration of follow up of the outcomes :	3-6 months 12 months longer
Do you use your outcome data to bring about regular improvements in the quality of your programme's performance?	Yes
Do you make the long term overall outcomes of your programme available to your patients or to the public ?	No

We have missed time for carrying out a continuing monitoring of our programme.

Nevertheless, a outcomes survey has been published in 2001, from a continuous series of126 new patients, who had started the programme throughout the year 1998 [4]. This provided information about:

- The participation in the programme: 100% of the patients attended 2 consultations or more, 75% attended four consultations or more.
- The natural progression of knee parameters during the programme (e.g. knee flexion and extention)
- The benefits of the programme: less regional pain and stiffness, less imaging prescriptions, less physiotherapy sessions required, regular return to work.



Another paper, by Bertrand Rousseau and al. [3], proved no difference between patients who had attended a similar programme in Nantes and those who had spent one month after surgery in an inpatient rehabilitation unit.

However, we wish to carry out a new assessment of the programme, with special attention to outdoor cycling as a major mean of the functional progression of the knee.

X. Quality improvement

A. WHICH ARE THE MOST POSITIVE POINTS OF YOUR PROGRAMME?

This PRM follow up programme has improved safety and functional recovery of patients after knee ligament reconstruction.

This programme doesn't require expensive means but a good knowledge of the optimal ways of healing and training. Within the past 10 years, this programme seems to have positively influenced the professional habits of many private physiotherapists in our area.

Isokinetic dynamometry has proved to be a very useful assessment tool as well as a very convincing mean to foster patients' commitment to their self training.

The concepts of this programme have obtained a national recognition by our scientific society and have been accepted as a good working basis in the negotiations between our PRM Professional Union and the National Health Insurance.

This programme is easy to duplicate and to adapt to any other local condition.

B. WHICH ARE THE WEAKEST POINTS OF YOUR PROGRAMME?

Even though patient's outcomes are systematically recorded in a digital database, we have missed time (and manpower) to organize a regular monitoring of the programme.

The scientific bases for isokinetic data interpretation may be still improved.

Regular outdoor cycling (20-25 km at least once a week) needs to be assessed as a very good (perhaps the best) way to recover a good level of functional parameters.

The shortage of PRM manpower versus the increasing number o-f patients referred by orthopaedic surgeons may become a difficult issue in a close future.

C. WHICH ACTION PLAN DO YOU INTEND TO IMPLEMENT IN ORDER TO IMPROVE YOUR PROGRAMME?

We wish to carry out a **new survey** of the programme

In order to cope with PRM Specialists (hopefully temporary) shortage, the second appointment at 2 months after surgery may be scheduled with the surgeon rather than with the PRM Specialist.

XI. References

Here are the main references used when the programme was set up. Several official recommendations and additional papers are also cited. A more detailed review of the recent literature will be completed when a new assessment of this programme will be carried out.

A. List of references

1. HAUTE AUTORITE DE SANTE, Prise en charge thérapeutique des lésions méniscales et des lésions isolées du ligament croisé antérieur du genou chez l'adulte, Juin 2008
2. SHELBOURNE KD, Nitz P.: Accelerated rehabilitation after anterior cruciate ligament reconstruction, Am J Sports Med. 1990 May-Jun;18(3):292-9
3. ROUSSEAU B, Dauty M, Letenneur J, Sauvage L, De Korvin G. : Rehabilitation after anterior cruciate ligament reconstruction: inpatient or outpatient rehabilitation? A series of 103 patients, Rev Chir Orthop Reparatrice Appar Mot. 2001 May;87(3):229-36
4. DE KORVIN G, J.P.Canciani, Rouseeau B.: Rééducation des ligamentoplasties du genou en ambulatoire, ann.orthop.Ouest - 2001 – 33
5. Recommendations for Private PRM Offices, issued in 2002 by the French Professional Union (SYFMER), in cooperation with the National Health Insurance (CNAMTS). Available from www.syfmer.og .
6. SAPEGA AA.: Muscle performance evaluation in orthopaedic practice. J Bone Joint Surg Am. 1990 Dec;72(10):1562-74
7. HAUTE AUTORITE DE SANTE, Mesure de la force, du travail et de la puissance musculaire par dynamomètre informatisé et motorisé, novembre 2006
8. DAUTY M, Tortellier L, Rochcongar P.: Isokinetic and anterior cruciate ligament reconstruction with hamstrings or patella tendon graft: analysis of literature., Int J Sports Med. 2005 Sep;26(7):599-606
9. CALMELS P and al.: Dynamométrie isocinétique dans le cadre du suivi MPR des ligamentoplasties du genou – Recommandations SOFMER-SYFMER. Version du 30/09/2009. Available from www.syfmer.org and from www.sofmer.com .

B. Details about national documents

1. French National bodies issuing, validating or implementing guidelines and recommendations

HAUTE AUTORITE DE SANT (HAS) : the High Authority of Health is the French official body responsible for the organization of professional assessment and for the validation of scientific recommendations, which are displayed on its website: www.has-**sante**.fr/ . These recommendations are based on systematic reviews of the International scientific literature and on experts' consensus. All specialized scientific societies cooperate with the HAS, which has links with other National and International similar organizations.

The French Society of PRM (SOFMER) is the official partner of the HAS for our specialty. The SOFMER organizes an annual scientific congress, an annual Consensus Conference and several other meetings. Information from the SOFMER works is available from its website is www.sofmer.com. The most important documents and papers are published in the SOFMER's English/French scientific journal, the Annals of Physical and Rehabilitation Medicine.

The French Professional Union of PRM (SYFMER) is responsible for negotiations about ruling and funding PRM clinical activity in France. Through the French Union of Medical Specialist (UMESPE), the SYFMER's delegates are appointed to the UEMS PRM Section and Board. In 2008, the SYFMER has decided to use the PRM Programmes of Care concept as the basis of its negotiations with Public Authorities. The SYFMER closely cooperates with the SOFMER for the scientific validation and support of its proposals. Website : www.syfmer.org .

2. French national recommendations about PRM follow up after knee ligament reconstruction

a) Recommendations for Isokinetic dynamometer use within the PRM follow up of patients after knee ligament reconstruction, in the perspective of funding of Isokinetic Dynamometry by the National Health Insurance.

SYFMER Group, responsible for negotiating with the National Health Insurance (UNCAM): Dr Georges de Korvin (vice-président du SYFMER, Rennes), Dr Bertrand Rousseau (Nantes), Dr Pierre Bénezet (Marseille), Dr Jean Sengler (président du SYFMER – Mulhouse)

SOFMER Group, responsible for the scientific validation of these medical recommandations : Dr Paul Calmels (coordinateur – CHU de Saint-Etienne), Pr Philippe Thoumie (président du conseil scientifique de la SOFMER, Paris), Pr Alain Yelnik (président de la SOFMER, Paris), Dr Hervé Collado (MPR AP-HM, Marseille), Dr Bertrand Morineaux (Nancy), Dr Denis Schmidt (MPR, Deauville), Dr Marc Dauty (MPR, Nantes), Dr Marc Genty (MPR, Evian), Dr Pascal Edouard (MPR, Saint-Etienne).

b) SOFMER Recommendations about the follow up of patients after knee ligament reconstruction

Coordinated by Dr Paul Calmels (Saint-Etienne University Hospital)

In progress.