



Prospective assessment of functional and clinical results of surgical patellar stabilization in rural and urban populations. Equal chance to success?

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Abstract

Introduction and Objective. Patella dislocation represents 3.3% of all knee injuries often leading to persistent instability. Medial patello-femoral ligament (MPFL) reconstruction is the standard method of treatment in the patellar instability. Rehabilitation after MPFL-R is a long and demanding procedure. The hypothesis presented reflects the idea that despite relatively good access to hospital care and surgical options, the post-operative rehabilitation care system is still inferior in rural areas versus the one offered in major cities and towns.

Materials and method. Between January 2015 – January 2018, 47 patients met the study inclusion criteria, diagnosed and operated on due to patellar instability. 8 patients were lost for full follow-up. Finally, 39 patients were included, divided into two groups – group A (19 from cities), group B (20 from rural area). Prospective KOOS and Kujala scales assessments were conducted: preoperative, 6 and 12 months after surgery. Knee isokinetic muscle strength was measured at 3 stages; prior to surgery, 6 and 12 months after reconstruction.

Results. All patients showed significant improvement measured in the KOOS and Kujala scales after the procedure, compared to the pre-operational results. Despite equal clinical improvement, patients from Group A (city) achieved better functional outcomes as presented in the results of knee extensor functional tests using a Biodex dynamometer.

Conclusions. Rehabilitation after MPFL reconstruction improves muscle strength and clinical outcome. Patients from rural areas had inferior functional results in comparison to the patients from major cities, even 12 months after surgical patella stabilization. Despite the development of roads and transport according to the EU cohesion policy, there are still differences in rehabilitation results between rural and city areas.

Key words

Patella instability, MPFL reconstruction, knee rehabilitation, EU cohesion policy, social equity of chance

INTRODUCTION AND OBJECTIVE

Approximately 80% of individuals employed in agriculture experience a musculoskeletal disorder at some point in their careers [1]. The demand for heavy physical work in agriculture is similar to the requirements of sports and recreational activities [2]. In both instances, the functional effort is mainly associated with jumping and twisting movements. Knee injuries are the second most prominent injuries after ankle sprain [3]. Despite efforts in prevention and infrastructure improvement, the frequency of such injuries continues to rise [4].

Patellar instability is a relatively usual disorder among all knee injuries and the most common dislocation of the knee observed among young adults [5, 6, 7]. The medial patello-femoral ligament (MPFL) is the primary stabilizer of the

patellae. The acute patellar dislocation strongly correlates with the MPFL rupture while its poor healing potential advocates the primary surgical reconstruction followed by strenuous rehabilitation with the use of variety of techniques [8, 9, 10]. Regardless of the surgical techniques applied, over 90% are reported to result in good to excellent clinical results [11, 12]. This is reflected in low recurrence rates, minimal morbidity, and fast functional recovery [13, 14].

The quality of medical care depends on the distance of the site of the accident from the hospital which, unfortunately remains valid today [15, 16, 17]. Diminishing the inequality between rural and urban areas becomes one of the aims of government policies in the European Union and in Poland [18]. EU Cohesion Policy contributes to strengthening economic, social and territorial cohesion. It aims to correct imbalances between countries and regions. However, some differences still exist, according to data [19].

In the presented hypothesis based on the authors' clinical experience, patients from rural areas have reduced chances

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of receiving proper rehabilitation timing and frequency, as seen through the prism of functional results.

OBJECTIVE

The hypothesis assumes that despite relatively good access to hospital care and surgical options, the post-operative rehabilitation care system is still inferior in rural areas versus that accessed in major cities and towns. This discrepancy might become even more pronounced when rehabilitation is expected to be a long-term process. The authors believe that this particular group of patients requires a prolonged rehabilitation protocol, and may highlight the effect of the limited and distant access to a rehabilitation facility.

MATERIALS AND METHODS

Between January 2015 – January 2018, 68 consecutive patients were diagnosed and operated on due to patellar instability by senior author (JW). The main indications for surgical patella stabilisation were: at least 2 patellar luxation episodes and positive luxation apprehension test [20]. Bilateral instability episodes, presence of osteochondral fractures and previous patellar instability surgery in the history were the exclusion criteria for 21 patients. Finally, 47 patients were included in this part of the study. From this group, 8 patients were lost to full follow-up and did not complete the study protocol.

Written consent for study participation was obtained from each of the patients, who were accordingly informed about the process and associated risk. The study protocol complied with the Declaration of Helsinki and was approved by the relevant local Bioethics Committee (Approval No. KE-0254/148/2014).

Patients were divided in 2 groups: Group A included patients living in cities (Lublin, Warsaw, Biała Podlaska, Zamość, and Chełm) with direct access to a rehabilitation facility, and Group B included those who lived in the rural area and had a one-way journey of more than 30 min to the rehabilitation facility. This selecting factor was based on patients' statement.

Finally, 39 patients we identified (26 women – 66.7%, 13 men – 33.3%) and included in the study. The average age of operated persons was 25.23 ± 9.04 years. Group A consisted of 19 patients (13 women – 68.4 % and 6 men – 31.6 %, average age – 21.52 ± 6.97). Group B consisted of 20 patients (13 women – 65 % and 7 men – 35 %, average age – 28.75 ± 9.36). There were no statistically important differences between the groups.

Evaluation was carried in the prospective manner in all enrolled patients. Clinical and biomechanical assessment followed by standardized subjective outcome questionnaires (KOOS and Kujala scale) were performed shortly before surgery (1–2 weeks) and consecutively 6 and 12 months post-surgery. Patients were followed clinically at least 24 months to exclude late clinical complications (recurrent patella luxations).

Functional assessment included isokinetic measurements performed solely by a single, experienced biomechanical laboratory specialist at the Biomechanical Laboratory AWF in Biała Podlaska (T.S.). Isokinetic analysis of the quadriceps function was measured at an angular velocity of 60 and 180 deg/s according to the study protocol: 1–2 weeks before surgery, 6 months and 1 year after surgery, using a Biodex

System 4-PRO dynamometer (Biodex Medical Systems Inc., Shirley, NY, USA). The subjects performed a 5-minute warm-up on a cycloergometer before the measurements.

Surgical procedure. The indication for an operative procedure was patellar instability with at least 2 'true' patellar dislocations. Clinical examination under anaesthesia confirmed the diagnosis. The pre-operative radiological assessment was performed, including analysis of the TTTG index and the Caton-Deschamp index. To rule-out other joint pathologies, an arthroscopic evaluation was also performed in each case, and MPFL was reconstructed from the autologous gracilis tendon and placed in the 'V'-shape technique [21]. The femoral tunnel was located by isometric technique using the adductor tubercle and medial epicondyle as the anatomical landmarks. The graft was first secured on the femur. Both position and tension were checked through full ROM aiming graft slacking over 45 deg of knee flexion (desired anisometry according to Thauinat [22]) and lateral margin of the lateral femoral condyle as border reference for patella positioning. Two sockets of 4.5 mm were made in the upper half of the patellae, and 'V'-shaped graft introduced and secured by sutures. The x-ray positioning technique described by Schoettle was additionally implemented, but only in the case of technical problems. If the TTTG index was higher than 18–20mm, tibial tubercle osteotomy was performed with the use of the Caton-Deschamps Index to dystalize or medialize/dystalize the tibial tubercle (TT) before MPFL graft tensioning. The number of TT osteotomies in both groups were equal (6 cases in each group). Trochlear dysplasia was not surgically addressed.

Rehabilitation protocol. There were no differences in the rehabilitation protocol between Group A and Group B. All patients attended an obligatory pre-operative rehabilitation visit during which they performed a standard set of exercises. During the visit, an instruction booklet was provided, and the post-operative PRICE technique, brace application, and walking with crunches technique explained.

After the surgery, a long leg brace was applied for 4–5 weeks, but patients were encouraged to use ROM with the aim of reaching at least 90 degrees of flexion by the 5th week post-op. Full weight bearing was allowed after 2–3 weeks. However, most of the patients tended to use support until the end of the 5th week. All patients were advised to visit the dedicated postoperative rehabilitation facility twice a week. The visit included manual therapy, exercise adjustment and presentation of the next steps in rehabilitation based on a 'home exercise programme' (HEP). Since 2009, the HEP has been implemented for all patellar instability patients. It was based on preselected, time and ability adjusted sets of exercise to be performed by patients in home. Patients were instructed to follow the schedule twice a day (self-controlled).

6–8 weeks after the surgical procedure functional recovery exercises were introduced in the gym which included bicycling, open and closed kinematic exercises and swimming. Return to work/school timing was usually set at 6–8 weeks post-operatively.

Clinical outcome measure and scales. Patients were evaluated in 3 stages – pre-operatively, 6 months, and finally 12 months post-operatively. The 24 months assessment was initially planned but could not be continued because compliance by

the patients, even after 6 months, was limited (8 patients did not finish even the 12 months protocol). The KOOS subjective knee evaluation form and Kujala scale were completed on each visit and then used to compare pre-operative and post-operative knee function. Data analysis was performed with paired T-student tests to evaluate differences in both pre-operative and post-operative subjective outcomes.

RESULTS

Functional assessment. The isokinetic test was conducted on the Biodex System 4 Pro (Biodex Medical Systems, Inc. New York, USA). Speed of 60 deg/s (5 repetitions) was treated as a 'strength test' to reflect maximum isokinetic resistance. The test performed at 180 deg/s (10 repetitions) was treated as an 'endurance test'. Both exercises are well-known standardized isokinetic tests for monitoring training after various types of knee injuries and surgeries [23–26]. Data analysis was performed with Mann-Whitney U Test, Friedman's ANOVA test, Kendall's coefficient, and Tukey's HSD Test to evaluate differences in outcomes.

The following code was used to depict the time-framing of the examinations:

- T1-pre-operative measurement;
- T2-measurement 6 months after surgery;
- T3-measurement 12 months after surgery.

Clinical results. Patients in both Group A and Group B showed statistically significant clinical improvement, as measured both in the KOOS preop and 12 months post-op (Group A 0.51 ± 0.15 vs 0.85 ± 0.09 ; $p < 0.001$; Group B 0.49 ± 0.15 vs 0.84 ± 0.07 ; $p < 0.001$ and Kujala scale pre-op and 12 months post-op (Group A 0.52 ± 0.17 vs 0.85 ± 0.08 ; $p < 0.001$, Group B 0.46 ± 0.16 vs 0.82 ± 0.09 ; $p < 0.001$) respectively for the pre-operative and post-operative results.

In the KOOS scale there is no statistically significant difference between both groups, both in pre- and postoperative results. (Preop 0.52 ± 0.17 vs 0.85 ± 0.08 , Group B 0.46 ± 0.16 vs 0.82 ± 0.09). Pre- and postoperative scores in the Kujala scale between both groups showed no statistically significant difference. (Tab 1) (Preop 0.52 ± 0.17 vs 0.85 ± 0.08 , Group B 0.46 ± 0.16 vs 0.82 ± 0.09).

Table 1. Pre-op and post-op KOOS and Kujala scales results for patients in Groups A and B

	KOOS Preop	KOOS Postop 12m	Difference
Group A	0.51 ± 0.15	$0.85 \pm 0.09^*$	0.33 ± 0.13
Group B	0.49 ± 0.15	$0.84 \pm 0.07^*$	0.35 ± 0.16
	Kujala scale Preop	Kujala scale 12m	Difference
Group A	0.52 ± 0.17	$0.85 \pm 0.08^*$	0.33 ± 0.15
Group B	0.46 ± 0.16	$0.82 \pm 0.09^*$	0.36 ± 0.18

* $p < 0.001$

Overall clinical results were coherent with those reported in the literature [27]. There was one case of redislocation in Group A 18 months postoperatively (out of the functional assessment study frame). The circumstances were unclear, and patient refused to be reoperated. We have noted clinical complications in the three patients during the study frame. First case was prolonged wound healing up to 8 weeks postop

and the second one prolonged pain during kneeling forcing the removal of the screws after 14 months since surgery in the Group A. We have one additional serious complication in Group B that required arthroscopic arthrolysis and manual manipulation under anaesthesia 4 months post-surgery. This patient was further lost for full follow-up and not included in the statistical analysis finally.

Functional results. Comparing the mean peak torque of extensors of the affected limb, at 60 deg/s, measured before MPFL reconstruction and on the study course statistically significant difference was found after 12 months (T3) when comparing Group A to Group B ($p = 0.042$). (Tab. 2).

Table 2. Results of the mean peak torque of extensors of the operated limb at 60 deg/s – Mann-Whitney U Test

Measurement	P	Group A [Nm].	Group B [Nm].
T1	0.537	106.6	96.9
T2	0.155	87.7	76.1
T3	0.042*	139.8	101.6

* $p < 0.05$; T1 - pre-operative measurement; T2 - measurement 6 months after surgery; T3 - measurement 12 months after surgery

Friedman's ANOVA test and Kendall's coefficient were used for comparison between groups. There was a statistically significant difference in changes in the mean peak torque of the extensors in both groups. Statistical difference was found for the urban Group A between T1-T3 and T2-T3 measurements, while no difference was found between T1-T2 measurements. For the rural Group B, a difference was observed between T1-T2 and T2-T3. No statistical difference was observed between T1-T3.

Comparison of the deficits between the operated and healthy limb for peak torque of extensors during the different stages of the study is presented in Tables 3 and 4. We found statistically

Table 3. Mean deficits between diseased and healthy limb for mean peak torque of extensors at 60 deg/s during the different stages of the study

Group	Measurement	Deficit [%]
A	T1	33.3
	T2	49.7
	T3	28.1
B	T1	33.6
	T2	48.9
	T3	42.7

T1 - pre-operative measurement; T2 - measurement 6 months after surgery; T3 - measurement 12 months after surgery

Table 4. Comparison of mean deficits between diseased and healthy limb for mean peak torque of extensors at 60 deg/s between different stages of the study – Tukey's HSD Test.

Group	Measurement	p
A	T1 - T2	0.027*
	T2 - T3	0.001*
	T1 - T3	0.911
B	T1 - T2	0.038*
	T2 - T3	0.827
	T1 - T3	0.467

* $p < 0.05$; T1 - pre-operative measurement; T2 - measurement 6 months after surgery; T3 - measurement 12 months after surgery

important difference in the T1-T2 measurements in both groups. The results obtained during T2-T3 measurements show a statistically significant difference only in the Group A. No such difference was found when comparing results between groups during the same study cycles.

Table 5. Results of mean peak torque of extensors at 180 deg/s – Mann-Whitney U Test

Measurement	p	A average [Nm].	B average [Nm].
T1	0.210	84.1	69.8
T2	0.118	70.0	57.8
T3	0.034*	101.2	76.5

*p<0.05; T1- pre-operative measurement; T2 – measurement 6 months after surgery; T3 -measurement 12 months after surgery

Comparing the mean peak torque of extensors of the affected limb, at 180 deg/s, measured before MPFL reconstruction and on the study course statistically significant difference was found after 12 months (T3) when comparing Group A to Group B (p=0.034). (Tab. 5)

Intra-group analysis showed a statistically significant difference in both groups between T2 and T3 measurements.

Deficits in extensor strength between an operated and a healthy limb during subsequent study cycles are shown

Table 6. Mean deficits between operated and healthy limb for peak torque of extensors at 180 deg/s during the different stages of the study.

Group	Measurement	Deficit [%]
A	T1	23.8
	T2	42.4
	T3	20.3
B	T1	26.8
	T2	45.6
	T3	34.3

T1 – pre-operative measurement; T2 – measurement 6 months after surgery; T3 – measurement 12 months after surgery

Table 7. Comparison of mean deficits between diseased and healthy limb for mean peak torque of extensors at 180 deg/s between different stages of the study – Tukey's HSD Test

Group	Measurement	p
A	T1 – T2	0.027*
	T2 – T3	0.004*
	T1 – T3	0.990
B	T1 – T2	0.019*
	T2 – T3	0.367
	T1 – T3	0.786

*p<0.05; T1- pre-operative measurement; T2 – measurement 6 months after surgery; T3 -measurement 12 months after surgery

in Tables 6 and 7. Similarly to the 60 deg/s test, there is a statistically important difference at T1-T2 in both groups and T2-T3, but only in the urban group. No difference was found when comparing results between the groups during the same study cycles.

DISCUSSION

The results show that post-operative, subjectively reported clinical results (KOOS, Kujala) in both Group A and Group B were much better than the pre-operative, and statistically important. This is in agreement with results reported in the literature. In a comprehensive prospective cohort study by Muliez et al. encompassing 129 knees from 124 patients, the Kujala score displayed a significant improvement, ascending from a pre-operative mean of 53.5 (SD 22.7) to a post-operative mean of 74.7 (SD 20.5; p < 0.01). Equally significant enhancements were observed in all KOOS subdomains (p < 0.01) [28]. In a study by Mitani et al., the Kujala score, the International Knee Documentation Committee subjective score, Knee Injury and Osteoarthritis Outcome score (KOOS), each item of the KOOS improved significantly after surgery. [29] Bremond et al., Carnesecchi et al., and Calanna et al. also observed a significant improvement of the Kujala after MPFL reconstruction (p<0.001) [30–32]. It should be underlined that there were no statistically important differences between Group A and group B in the clinical results pre-operatively and post-operatively. Interestingly, there were fewer complications and patella destabilization compared to those reported by some authors. A meta-analysis conducted by Shah et al. revealed a notable occurrence of complications, with a total of 164 instances observed among 629 knees (26.1%) [33]. In the study by Parikh, which encompassed a total of 179 knees undergoing MPFL reconstruction, 38 complications were recorded, affecting 29 knees (16.2%) [34]. In contrast, a systematic review conducted by D'ambrossi et al. encompassed 332 patients, comprising 195 females (63.5%) and 112 males (36.5%), with a cumulative total of 352 treated knees. The study revealed a relatively low incidence of complications – 16 patients (4.5%), and a total of 18 (5.1%) cases of patellar instability recurrence were documented [35]. In a study by Malecki et al. involving a follow-up of 21 patients (26 operated knees), a singular recurrence of dislocation was observed in 3 patients (11.5%) [36].

The low complication rate in the current study could potentially be attributed to the age disparity in the study group compared to other authors. It is a well-established fact that in the literature MPFL reconstructions tend to yield less favourable outcomes among younger patient populations [37]. Another contributing factor could be the relatively short follow-up duration of only 2 years, compounded by the loss to follow-up of 8 patients. A longer follow-up might have revealed additional complications.

Generally, the complications rate in this study was low (total 10.2%, 24 months redislocation rate 2.5%) and within the limits ranging from 0% – 32.3%, as described in the extensive metanalysis done by Jackson et al. [38]. This data, along with the results of the current study, confirm the thesis that MPFL reconstruction efficiently enhances patellar stability from a clinical perspective.

When the above-mentioned subjective clinical results are assessed exclusively, the initial hypothesis of this study might appear to be false and misleading. The functional results of the currently study, more objective than subjective scales revealed statistically important differences and were evidently inferior in Group B (rural). The results related to the force moments of the knee extensors (both 60 deg/s and 180 deg/s) indicate that the results of patients from Group A (urban) were significantly different and had better functional

outcome than in Group B (rural) 12 months after surgery at the study functional end-point (respectively, $p=0.042$; $p=0.034$). Additionally, the values of these parameters obtained by group A tend to be better, on average, by 30%; however, this value was not important statistically. As described previously, the only difference between Group A and Group B was the declared travelling distance to a rehabilitation facility. This fact reflects the most important finding of this study, that according to the data, the travelling/transport distance might negatively influence the functional results. at least if patients require rehabilitation overlook and compliance. In the literature, there are studies concerning the relationship between treatment outcomes and the distance between a patient's home and amedical facility.

In the study by Levaillant et al. concerning hip joint prosthesis surgery (prosthetic hip replacement), neither the travel time nor the distance to the healthcare facility showed any significant associations with either mortality or readmission rates in the analysis [39]. According to the authors of the current study, there is a lack of articles related to this issue specifically for patients undergoing ACL or MPFL reconstruction.

In both Group A and Group B, functional performance as indicated by extensor strength was inferior in the first 6 months, but this was statistically not significant. In Group A, however, the tendency might be observed to reach better functional results after 12 months than pre-operative. Contrary to this, Group B patients were not able to reach the pre-operative levels. This indirectly supports the above-mentioned thesis about the negative correlation distance/functional results.

Another important finding in the current study was that the extensor strength was weakened in the involved knee, compared to the uninvolved knee in both groups in the pre-operative and post-operative periods. Table 6 indicates that after the 12 months long rehabilitation, there were still functional deficits present in both groups, comparing the involved and uninvolved knees. The rehabilitation effect diminished the difference, but the involved/uninvolved knee discrepancy still existed. This fact confirms the hypothesis of this study, meaning that at least part of the MPFL reconstructed patients were not able to reach normal extensor strength even after 12 months of rehabilitation. This is concurrent with some data from the literature. The study by Matsushita et al. demonstrates that knee extensor strength showed improvement in the majority of patients following MPFL reconstruction, albeit still presenting an approximately 20% deficit against the non-operated legs even 2 years post-surgery. This observation suggests the need for ongoing rehabilitation and strength-building efforts to address persistent disparities in knee extensor function post-intervention [40]. The study conducted by Krych revealed that surgical stabilization, including MPFL reconstruction, proves to be an effective approach for facilitating athletes' return to competitive sports following recurrent lateral patellar instability. Nevertheless, the study describes the persistence of strength deficits up to 6 months after surgery [41]. Ronga et al. conducted an evaluation of isokinetic data after isolated MPFL reconstruction with a mean post-operative period of 3.1 years. Their findings revealed a consistent pattern of weakness in all assessed variables within the operated limb, compared to the contralateral lower extremity [42].

One additional remark should be mentioned, that even the functional results of the 'better' group A (urban) did not meet suggested deficits reduction between limbs to the expected 10% [43, 44]. This is in agreement with previous studies by the authors of the current study which suggested that improvement in knee functional results remain to be inferior in the ACL reconstruction group of patients after 12 months of rehabilitation [45].

Finally, the results obtained in this study are contrary to the opinion that MPFL reconstruction equalizes the gait pattern and knee kinematics even 12 months post-surgery [46, 47].

Limitations of the study

Due to limited number of the patients it was not possible to correlate statistically the PFJ morphology (trochlear dysplasia) with the clinical and/or functional results. The authors acknowledge this important drawback. Nonetheless, existing evidence suggests a lack of significant association between these 2 features [48]. Contrary to Hiemstra's report, the degree of trochlear dysplasia negatively affects the clinical outcome after the MPFL-R [49].

Other limitations of the study were the interpretation of clinical results obtained from the scales used [KOOS, Kujala], and secondly, patients were observed for only for 24 months. Although being broadly selected in many studies, there are only a limited number of issues/questions in KOOS and Kujala scale directly related to the instability and only recurrent luxation is considered as the endpoint To address this issue the new scale has been proposed to properly assess clinical outcomes among patients after MPFL reconstruction but we were not able to use it at the study start-point [51].

An additional limitation was the relatively short follow-up since it is known that the majority of re-luxations occur later than 2 years post-operatively [50].

Functional limitations. It was not possible to fully control patients' compliance nor the number of rehabilitation visits during the study frame. No functional examinations were carried out later than 12 months post-op, the reason being that most patients refused to carry out initially planned 24 months functional assessment; they claimed achieving subjectively satisfying result earlier. Moreover, for the same reason, 8 out of 47 patients did not complete even 12 months assessment. This might be of some significance if taking into consideration the possibly that after 12 or more months, functional discrepancies might tend to diminish between the groups. Generally, patients refused to travel for biomechanical testing as they were satisfied with the clinical results and were aware of existing functional deficits.

Data collection and inclusion criteria. An additional limitation occurred in the data analysis in which 2 stipulated assumptions were adopted during the study. Firstly, the hypothetical distinction between study groups from urban and rural areas, and secondly, the assumption that the 12 months biomechanical assessment might be adequate to prove differences in access/result of the rehabilitation. The group inclusion criteria were based solely on patient declarations and may not reflect actual relation to the true urban/rural environment. However, the patients from Group B (rural) clearly rejected cities as living area, while Group A assigned themselves to the one of the cities on a list provided. However, it has to be admitted that travel time limit as an

inclusion criteria might also have been adopted by those who declared living in cities. This meant that in this group some patients might have travelled over 30 min through the city to the rehabilitation facility. This was factor that was not discredited in Group A.

Equity of chance. The main and most prominent result of the presented study was to indicate and confirm existing differences in functional outcomes of treatment between patients who potentially have better access to rehabilitation (urban), and those with limited access (rural). Thus, the byplay was to prove the relevance of rehabilitation in the overall success of treatment.

The presented data shows statistically important disproportion in the functional results obtained between the rural and urban populations, which occurred despite the development of infrastructure [18, 19] and increased access to modern medical facilities. Factors such as infrastructure advancement in urban-rural areas, for example, new hospitals, clinics, roads, communication, etc., seem to contribute to the general improvement in the treatment of today's patients, although the equalization process has not yet been completed [52].

CONCLUSIONS

MPFL reconstruction improves patients' status and muscle strength, thus assuring a good clinical result. Patients from rural areas had inferior functional improvement in comparison to patients from major cities. This is not normalized even 12 months after surgery. Equity of chance as related to the rehabilitation results after surgical stabilization of patellae has not yet been achieved. It would be interesting if this fact may be extrapolated for the other medical equity features.

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