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Platelet-rich plasma: promising method in the osteoarthritis treatment

L. Khimion[1], A. Buryanov[2], L. Smolina[1]
[1]P.L. Shupyk National Medical Academy of Postgraduate Education Department of Family Medicine
[2]O.O. Bogomolets National Medical University, Department of Traumatology and Orthopedics

The results of the clinical use of the autologous platelet-rich plasma (PRP) at the knee osteoarthritis treatment are presented in the article.
Key words: platelet-rich plasma (PRP), knee osteoarthritis.

Osteoarthritis (OA) is a chronic degenerative progressove pathology of hyaline cartilage. OA accounts for profound morbidity, pain and health care expenses. The consequences to the individual and to the population as a whole are very significant, particularly with our aging population [2]. There are few validated interventions that can improve the functional state of patients once the degenerative process becomes symptomatic. Taking into account the lack of response of the body's healing mechanisms to degenerative conditions generally, local use of the stimulating and growth factors to activate cartilage regeneration is sensible. At the moment the steam cells therapy, PRP and mixed techniques are intensively investigating for OA treatment [1, 2].

Platelet rich plasma (PRP) is a novel therapeutic tool of autologous nature that has emerged in recent years. The application of PRP in different tissues has given promising results in different pathologies such as acute and chronic injuries of bone and cartilage [1, 3]. PRP treatment has demonstrated a quite prominent potention in rheumatology, orthopedics and sport medicine. Its therapeutic target eminently comprises chronic processes, although the range of indications is constantly expanding; PRP has been successfully used in many ailments, including knee osteoarthritis. Its low cost, ease of use, usefulness in pathological processes and high safety put it at the center of the researchers interest [3, 4].

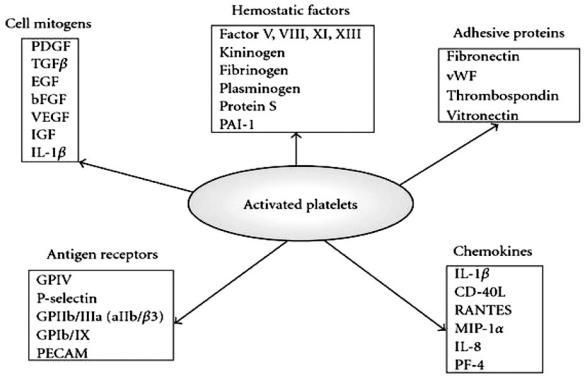
PRP owes its therapeutic interest to the crucial role of platelets in the wound healing and tissue regeneration [4, 5, 8]. This role is not related to the repairing properties of the platelets themselves but, rather, to growth factors (GF) released by its 6 granules, which possess multiple regenerative properties (diagrame 1).

Tissue wound repair is a complex process in which a variety of cellular functions such as chemotaxis, angiogenesis, cell proliferation, extracellular matrix formation and the "cleansing" macrophage coexist, sequentially and covertly [5, 6]. These functions form a complex in which three relatively distinct phases are classically distinguished: inflammation, proliferation and remodeling.3, 4, 5, 6, 7 All GF content of the PRP is involved in the phases described, but all of their functions are still fully unknown. It is speculated that some of them play a role,4 but it is conceivable that each individual prominence varies depending on the type of tissue wound (ruptured, inflammation, degeneration, etc.) and the type of tissue (tendon, muscle, bone, etc.). PRP efficacy for the cells reparation process activation was demonstrated experimentally and confirmed in few clinical studies but researches used different PRP preparations so results often are not comparable [6]. Also platelet quantification and the growth factor content definition must be defined in order to understand molecular mechanisms behind PRP regenerative strength. Standardization of PRP preparations is thus urgently needed [6,7,8].

Objective. To study the efficacy and safety of the PRP use in knee OA (stages I-II) treatment.

METHODS

The study was conducted at the Department of Family Medicine of the P.L. Shupyk National Medical Academy of Postgraduate



PDGF, platelet-derived growth factor; TGFβ, transforming growth factor β; EGF, endothelial growth factor; βFGF, fibroblast growth factor; VEGF, vascular endothelial growth factor; IGF, insulin-like growth factor; IL-1β, interleukin-1β; PAI-1, plasminogen activator inhibitor 1; vWF, von Willebrand factor; GP, glycoproteins; PECAM, platelet and endothelial cell adhesion molecule; CD40L, CD40 ligand (CD154); RANTES, regulated on activation, normal T-cell expressed and secreted; MIP-1α, macrophage inflammation protein 1α; IL-8, interleukin-8; PF4, platelet factor 4 [8]

Diagram 1. Platelet components involved in the coagulation cascade and the atherosclerotic process.

Education (Kyiv, Ukraine), in 2 groups of patients with diagnosed knee OA (I–II radiological stage). The patients with severe co-morbidities, trauma or after knee surgery were not included at the study. 28 patients (9 men (30.8%) and 19 women (69.2%), aged 35–55 years (mean age 44,7±1,2 years) were divided on 2 groups. Group 1 included 14 patients who consented to receive standard OA treatment (non-steroidal anti-inflammatory drugs (NSAID), physiotherapy, massage, exercises) and 3 intra-articular injections of PRP (total volume – 12–15 ml, mean platelets number 860,24±32,1×10^9/мl) weekly; group 2 consisted of 14 patients of comparable age with the same diagnosis who received only standard OA treatment. The CRP-level, WOMAC scale and Lequesne index was analyzed before treatment and 1, 3, and 6 months after course of treatment in both groups.

RESULTS

CRP level was modestly abnormal in the 42,9% patients of group 1 and 35,7% patients of group 2; during the treatment period CRP got to normal in all patients, but during the follow-up period, – after 3 and 6 months of treatment in the study group it was significantly lower (7,34±0,52) and (4,34±0,22) mg/L, than in the control group (9,56 ± 0,67) and (6,92±0,57) mg / L ($p < 0,005$); in addition in 3 patients of group 2 CRP level had increased again after 3 months which was the sign of OA exacerbation; in group 1 there were no OA exacerbations during 6 months of follow-up . WOMAC and Lequesne index had positive dynamic during treatment in both patients groups. At month 6 functional status of the patients in group 1 improved by 23% in stiffness (at the beginning of the study it was (3,8±1,0) which had siginificant differnece with patients of control group (3,6±0,1) – at the begining of the study and (2,4±0,1) in 6 month after treatment. Pain during movement and after passing the distance decreased after treat-

Table 1

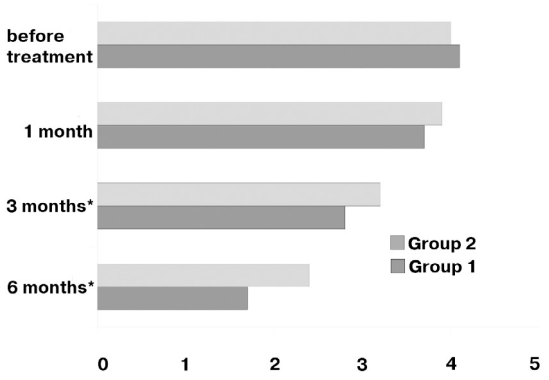
Dynamics of the WOMAC indicators during the study

Indicator	Pain	Stiffness	Function	Total score
Main Group				
before treatment	11,9±1,3	3,8±1,0	41,8±3,2	55,5±2,8
1 month	8,0±1,8	2,5±0,8	37,8±3,8*	48,3±0,8
3 month	6,8±1,5*	2,1±0,4*	24,7±3,8*	33,2±0,4
6 month	5,3±1,3*	1,7±0,7	18,4±3,1*	22,4±2,6
Control Group				
before treatment	10,2±1,0	3,6±1,0	42,8±3,0	56,0±3,5
1 month	8,03±1,1	3,3±0,8	39,1±3,2	52,4±4,7
3 month	7,9±1,3	2,5±0,4	28,0±3,7	38,4±3,2
6 month	6,5±1,3	2,4±0,8	24,6±3,2	32,0±2,2

ment by 37.8% in group 1; pain and discomfort when climbing and descending the stairs decreased by 38.6% (these indicators in group 1 at the beginning of the study were (10,9±1,3) (in group 2 – (10,2±0,9) and in 6 month after treatment – (2,3±0,3) in group 1 and (4,5±0,3) in group 2) ($p<0,05$). At the end of follow up period patients functional activity increased by 44.1% in group 1which was better then positive changes in group 2 and was accompanied by a significant reduction of restrictions in daily activities. There were no adverse events due to use of PRP injections in group 1.

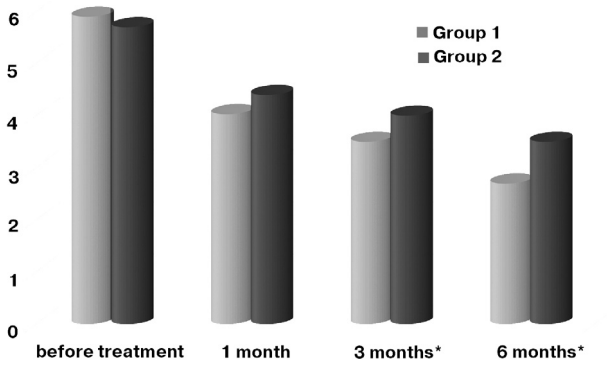
CONCLUSION

The course of 3 intra-artricular injections added to the standard treatment of knee OA improves functional activity, reduces pain and probably can prolong remission in patients with the early stages of disease. The further long-term studies are needed with the use of ultrasound and MRI monitoring of the articular cartilage to obtain more accurate information and determine the most effective methods of PRP use in OA treatment.



Note: * – the difference between the groups of patients with significant ($p<0,05$)

Picture 1. Visual analogue scale of pain (cm)



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Picture 2. The functional status of patients in the two groups (estimated total functional index M.G. Lequesne) in points

Обогащенная тромбоцитами плазма: новый метод в лечении остеоартроза

Л.В. Химион, А.А. Бурьянов, Л.А. Смолина

В статье представлены результаты использования аутологичной, обогащенной тромбоцитами плазмы в лечении остеоартроза коленных суставов.

Ключевые слова: *обогащенная тромбоцитами плазма, остеоартроз коленных суставов.*

Збагачена тромбоцитами плазма: новий метод у лікуванні остеоартрозу колінних суглобів

Л.В. Хіміон, О.А. Бур'янов, Л.О. Смоліна

У статті представлено результати застосування автологічної, збагаченої тромбоцитами плазми у лікуванні остеоартрозу колінних суглобів.

Ключові слова: *збагачена тромбоцитами плазма, остеоартроз колінних суглобів.*

Information about authors

Ludmila V. Khimion – MD, PhD, *Liudmyla A. Smolina Family Medicine Department National Medical Academy of Postgraduate education 9 Dorogozhytska str, Kyiv, 04112, Ukraine, tel./fax.: +38 (044) 483-04-35. E-mail: ludmilahimion@hotmail.com

Alexandr A. Buryanov – MD, PhD, Department of Traumatology and Orthopedics National Medical University, 27 Bulvarno – Kudryavska str, , Kyiv, 01601, Ukraine, tel.: +38 (067) 796-68-76

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