

Can Platelet-rich Plasma Injection Help Avoid Replacement Surgery in Osteoarthritis of the Knee?

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ABSTRACT

Introduction: Osteoarthritis (OA) of the knee is a chronic degenerative condition where pain is the predominant symptom. The most important reason for replacement surgery in advanced OA of the knee is pain. But pain may persist even after total knee arthroplasty in about 20% situation. Clinicians are searching an easier alternative to knee arthroplasty.

Materials and methods: Platelet-rich plasma (PRP) is a new modality of treatment which helps in regeneration and relieves pain. It has been used successfully in injured and degenerated tissues. It has been used successfully in knee OA too. Most studies indicate it as an excellent modality and superior to hyaluronic acid (HA) injection in the knee. Some studies indicate that the combination of PRP and HA is even better than PRP alone.

Discussion: Inspired by recent studies on PRP, question is raised on whether PRP injection can help avoid replacement surgery? But unless more studies with PRP are conducted on advanced OA, we cannot comment on this based on the available literature.

Keywords: Osteoarthritis of the knee, Platelet-rich plasma, Total replacement of the knee.

Journal on Recent Advances in Pain (2019); 10.5005/jp-journals-10046-0124

INTRODUCTION

Osteoarthritis of knee is a common degenerative condition of the knee which is characterized by pain and limitation of joint movements. It significantly affects the quality of life. Degeneration and damage of articular cartilage is the hallmark of the pathological process, and subchondral sclerosis, hypertrophied joint margin, and osteoporosis of subchondral bones are secondary changes. Radiological reduction of joint space and osteophyte formations are commonest features. The causes of pain in OA of the knee are many, but low-grade inflammation and sensitization of nerve endings are important mechanisms.

Osteoarthritis of the knee affects both male and female. It is the most common joint problem in the United States and the prevalence of symptomatic OA of the knee is high in elderly population. It is seen in 10% of men and 13% of women after 60 years of age.¹ It is more prevalent in the Indian population. The overall prevalence of OA of the knee in India is 28.7%. It is more common in females particularly after 45 years of age with a prevalence of 31.6%, but more common in males below 45 years of age. Other risk factors are obesity, age, and sedentary work.²

The predominant symptom of OA is pain which brings a patient to a doctor. But the severity of OA and pain may not match. There are many factors that determine the severity of symptoms and many are still unknown.^{3,4} Factors which may be associated with more pain are the depression of patient, chronicity or duration of OA, obesity, traumatic joint injury, and the presence of other joint pain and inflammatory arthropathy. There are numerous studies which tell that radiological grading and symptom severity do not match in OA.³⁻⁵ Assessment of pain with severity, characteristics, and aggravating and relieving factors are important to understand pathophysiology of pain in OA of the knee.

The goals of management of OA knee are reduction of pain and restoring the function. In early stages, it is managed by analgesics such as paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) along with coanalgesics like duloxetine. Exercise and other physical therapy are also important in management plan. Injection of intraarticular HA and in selected cases injection of

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How to cite this article: Das G, Dutta D, *et al.* Can Platelet-rich Plasma Injection Help Avoid Replacement Surgery in Osteoarthritis of the Knee? *J Recent Adv Pain* 2019;5(1):13-15.

Source of support: Nil

Conflict of interest: None

corticosteroids also have important role in the management of early OA knee. In advanced OA of the knee if symptoms are not relieved, total knee arthroplasty is indicated. In recent years, PRP injections are becoming popular and has been seen to be effective in various stages of OA knee. In this article, we are trying to search literature to find out the role of PRP injection in OA knee and whether it can be an alternative to total knee replacement surgery.

REVIEW OF LITERATURE

The most common reason for knee replacement surgery is pain that is not resolved by conservative management.⁶⁻¹⁰ Thus, the most important goal of total knee replacement surgery is pain relief. But unfortunately, pain may persist or worsen in a significant number of patients even after total replacement of the knee.¹⁰⁻¹⁴ The prevalence of pain after knee replacement surgery is high, around 20%.¹¹ Pain may persist or worsen in 14-36% patients after other joint replacement surgery too.¹⁵ Apart from persistence of pain, there are risks associated with anesthesia and surgery in patients compromised with comorbidity. But the other most important disadvantage of total knee replacements is the cost of the treatment which is particularly important in developing countries. Average cost of knee replacement surgery has been slashed,¹⁶ but still it is beyond the reach of majority of Indians. Other recent studies conclude that many total knee replacement surgeries are

unnecessary, and in one study, it has shown that approximately one-third of total knee replacement surgeries were inappropriate in American population.¹⁷ Total knee replacement surgeries have been increased by several folds and the most important reason may be better insurance coverage and monetary gain.^{17,18}

Pain is the most important reason for replacement surgeries and there are several options for managing pain other than oral medicines or physical therapy. Intraarticular steroid injection and HA polymers injection have disadvantages of short-term results or effective only in early stages.¹⁹ Radio frequency ablation is another effective treatment option for knee pain^{20,21} which is even effective in advanced OA, but it does not have any regenerative property of the degenerative knee.

Platelet-rich plasma injection is considered as a type of regeneration therapy that reduces pain and promotes healing of degenerated tissues.^{22,23} Normal joint metabolism is altered in OA. There is increased catabolism and anabolism is decreased. Platelet alpha-granules have numerous growth factors which are released on injection; these include platelet-derived growth factor, hepatocyte growth factor, vascular endothelial growth factor, and transforming growth factor- β ,²⁴ which may change the disease process in OA. Platelet-rich plasma also decreases cartilage catabolism, improves cartilage anabolism, and promotes chondrocyte proliferation and remodeling. There is synthesis of higher amounts of collagen II and good physiological prostaglandin with increased production of matrix molecules.^{25–30} Synoviocytes are stimulated with PRP injection and it increases HA secretion³¹ and creates a better and favorable environment inside the joint. All these changes decrease pain and improve joint function after PRP injection in knee joint OA.

There are several studies which support that PRP is one of the most promising treatment modalities for the management of pain in OA knee. Recent researchers have found positive treatment outcome. Superiority of PRP has been demonstrated in relieving pain symptoms and improving knee scores in majority of these studies.

Ali Soliman Hassana and his colleagues demonstrated improvement of pain and functional status of knee joint as measured by the visual analogue scale (VAS) for pain and International Knee Document Committee scale (IKDC) for functional status. They also assessed the knee with ultrasonography, found significant improvement in Doppler activity, and noticed synovial thickening after 6 months of PRP injection.³²

Louis et al. found that PRP injection is superior to HA injection. They also assessed relationship of success between PRP cell counts and the contents of vascular endothelial growth factor, platelet-derived growth factor-AB, transforming growth factor β 1 content of injected PRP. They found better results when platelet-derived growth factor-AB and transforming growth factor β 1 concentrations are higher.³³

Cole and colleagues compared HA with PRP injection and studied biochemical markers inside the joint in a double-blinded randomized controlled trial. They concluded that PRP gives better pain relief than HA. They also found that intraarticular proinflammatory cytokines are decreased and anti-inflammatory cytokines are increased which probably gives better analgesia in PRP group.³⁴ Kon et al. also found superiority of PRP over HA in OA.³⁵ Although in another study, Filardo et al. found PRP no superior than HA, although both PRP and HA provided significant pain relief and functional improvement.^{36,37} Spaková and others found better results with PRP than HA.³⁸ Görmeli and colleagues found PRP better than HA.³⁹

Lana et al. has also shown that the combination of PRP and HA is better than either PRP or HA alone.⁴⁰ Iio et al. studied the release

of growth factors from platelets and compared it when mixed with HA. They found that the levels of growth factors released by PRP were increased by the addition of HA. A mixture of PRP and HA may be a more effective therapy than PRP or HA alone for OA and tendinopathy.⁴¹

There are number of other publications showing very good results after autologous PRP injection at OA of the knee.^{42–47} In a level 1 systematic review, Meheux and others found a significant improvement of pain and other functions in OA of the knee.⁴⁸ In another level 1 meta-analysis by Dai, it was found that PRP injection is beneficial at least up to one year.⁴⁹

CONCLUSION

A majority of OA of knee patients who do not get good pain relief were taken for surgery. With the advent of PRP injection, surgery can be avoided at least in a significant proportion because these patients can get benefits of PRP injection, so surgery will be unnecessary even when oral medications fail.

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