

Intra-articular Laser Treatment Plus Platelet Rich Plasma (PRP) Significantly Reduces Pain in Many Patients Who Had Failed Prior PRP Treatment

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ABSTRACT

INTRODUCTION: In our practice Platelet Rich Plasma (PRP) injections effectively reduce pain in most but not all arthritic patients. However, for patients who fail PRP treatment, no good alternative currently exists except total joint replacement surgery. Low level laser therapy (LLLT) on the surface of the skin has not been helpful for arthritis patients in our experience. However, we hypothesized that intra-articular laser treatment would be an effective augmentation to PRP injection and would increase its efficacy in patients who had failed prior PRP injection alone.

METHODS: We offered Intra-articular Low Level Laser Therapy (IAL) treatment in conjunction with repeat PRP injection to patients who had received no benefit from PRP injection alone at our center. They were the treatment group. They were not charged for PRP or IAL. They also served as a historical control group since they had all had failed PRP treatment alone. 28 patients (30 joints) accepted treatment after informed consent. 22 knees, 4 hips, 2 shoulder glenohumeral joints and 1 first carpo-metacarpal (1st CMC) joint were treated

RESULTS: All patients were followed up at 1 month and no adverse events were seen from the treatment. At 6 months post treatment 46% of patients had good outcomes, and at 1 year 17% still showed improvement after treatment. 11 patients failed treatment and went on to joint replacement.

DISCUSSION: A single treatment of IAL with PRP salvaged 46% of patients who had failed PRP treatment alone, allowing avoidance of surgery and good pain control.

Keywords: Platelet Rich Plasma, Low level laser therapy, osteoarthritis

1. INTRODUCTION

In our practice Platelet Rich Plasma (PRP) injections effectively reduce pain in most but not all arthritic patients. However, for patients who fail PRP treatment, no good alternative currently exists except joint replacement surgery. We have not found second PRP injections to reduce arthrosis symptoms if a first injection failed. We, and others^[1-4], have not found Low Level Laser Therapy (LLLT) on the skin to reduce arthrosis symptoms, while others have reported success^[5-8]. However, there is some evidence that LLLT can augment PRP effects^[9, 10]. There is also evidence that intra-articular laser probes can be effective in the treatment of arthrosis^[11] (SUE: personal communication Michael Weber)

We therefore hypothesized that intra-articular laser treatment (IAL) might be an effective augmentation to PRP injection if used intra-articularly and might increase the efficacy of a subsequent PRP injection in patients who had failed prior PRP injection alone.

2. METHODS

We offered Intra-articular LLLT treatment (IAL) in conjunction with repeat PRP injection to patients with arthrosis who had received no benefit from PRP injection alone. They were the treatment group. They were not charged for PRP or IAL. They also served as a historical control group since they had all failed PRP treatment alone. Twenty-eight patients (30 joints) accepted treatment after informed consent; 22 knees (20 patients), 4 hips, 2 shoulder glenohumeral joints and 2 first carpo-metacarpal (1st CMC) joints were treated. All patients had radiographic and symptomatic symptoms of osteoarthritis. Sixteen patients had received 1 prior PRP injection without improvement in symptoms. Fourteen patients had received two or more previous injections without relief. Of the 14, all received at least 1 injection of PRP and additional injections of either PRP or Synvisc. The mean age of the patients was 67 years (range 54-88) and the mean BMI was 29.0 (range 18.6- 40.2). Fourteen were male and 16 were female. Treatment was performed on 18 right joints and 12 left joints.

PRP was prepared according to a previously published technique^[12] that is expected to roughly quintuple the platelet count. The patient's affected joint was sterilely prepped and 2 Weber intra-articular needles (Weber Medical: <http://www.webermedical.com/en/contact>) were inserted at two sites within the same joint using sterile technique and local subcutaneous, but not intra-articular, lidocaine infiltration. The PRP was then injected into one of the needles. Two Weber intra-articular laser flexible wires were inserted, one into each hollow needle. Each site had 10 minutes of red, infra-red and blue laser radiation at 100 MW. The patients sat or reclined during the procedure. The needles were removed when the procedure was completed. The senior author (CP) performed all procedures.

Patients were followed up at 1 month, 3 months, 6 months and 1 year after treatment. They were asked to provide a per cent better or worse than before treatment at each followup.

3. RESULTS

All patients were seen post-treatment and there were no adverse events in any patient. 26 of 30 patients (87%) were available for followup at 6 months and 23 of 26 patients (4 patients have not reached 1 year yet) (88%) were available at 1 year. At 6 months, 12 of 26 patients (46%) had a good result: 7 of 12 knees, 3 of 4 hips, 1 of 2 shoulders and 1 1st CMC joint. At 1 year, 4 of 23 patients remained improved from before treatment (17%): 3 of 18 knees, 0 of 3 hips, 0 of 2 shoulders, and 1 1st CMC joint. A good result was defined as a per cent improvement of at least 40%, normal function with activities of daily living and avoidance of joint replacement surgery.

11 patients had joint arthroplasty performed after the treatment: 7 knees, 3 hips, and 1 shoulder. Mean time to replacement was 10 months after treatment

Of the 22 knees, 16 had medial joint compartment disease, 2 had lateral compartment disease and 4 had patellofemoral disease. Although the subgroup was small, the best results were seen in patients with patellofemoral disease with 67% improved at 6 months, 50% improved at 1 year, and no arthroplasty in this group. The medial compartment group was separated by radiologic measurements into 3 groups: 10 with bone-on-bone changes in this joint (BOB) or 1 mm of joint space; 3 with 2mm-3mm of joint space, and 3 with 4mm or greater joint space. The 2mm-3mm subgroup had the best response to treatment with 67% showing improvement at 6 months and no arthroplasties in the group. Five of the six arthroplasties were in the BOB & 1mm group, which had an overall 33% good rate, and 1 was in the 4mm and up group.

4. DISCUSSION

This study is the first to show good clinical results using IAL in conjunction with PRP for arthrosis in humans. No complications or adverse events occurred. Overall 46% of patients had good clinical relief at six months post treatment. These patients were all total joint replacement candidates prior to IAL. The results deteriorated in roughly half of these patients by one year post treatment.

The obvious weakness of our study design is the lack of a control group which would have had repeat PRP injection, after their initial failed injection, but without IAL. Thus we cannot rule out the possibility that some of our PRP-IAL patients would have improved with a repeat PRP injection alone without IAL. It is not our custom to perform a repeat PRP injection in patients who fail an initial injection. When patients have requested a second injection in the past after a failed first injection however we have never found clinical benefit to occur. Therefore we think it is unlikely that our current study patients would have benefited without IAL from repeat PRP alone.

Our study is too small to draw conclusions regarding sub groups. But it is important to realize that many of the knee, hip and shoulder patients had severe "Bone on Bone disease." Thus this treatment regimen has been effective even in the most severely affected patients. For all of these patients total joint replacement was the only reasonable alternative to this treatment regimen. And indeed many of the failures of treatment went on to total joint replacement.

It is also important to realize that only one of these patients had a second IAL-PRP treatment. It is likely therefore that repeat treatment would produce enhanced clinical benefit in many. Our study was self funded by our clinic and resources were limited to expand this pilot study. Neither PRP nor IAL is reimbursed by insurance.

While we did not have a non-treatment control group the six month follow up period for evaluation of efficacy is well established as a benchmark for true clinical benefit. This is the standard used for visco-supplementation injection. Placebo effect virtually never extends beyond 3 months. Therefore we believe that these clinical effects represent a true response to treatment.

5. CONCLUSION

IAL in conjunction with PRP is safe. It has significant efficacy in reducing arthrosis symptoms for six months in some patients who had failed prior PRP injection for the knee, hip, gleno-humeral and first carpo-metacarpal joints.

REFERENCES

- [1] A. Gur, A. Cosut, A.J. Sarac, R. Cevik, K. Nas, A. Uyar, "Efficacy of different therapy regimes of low-power laser in painful osteoarthritis of the knee: a double-blind and randomized-controlled trial", *Lasers in surgery and medicine*, 33(5) 330-338 (2003).
- [2] Z. Huang, J. Chen, J. Ma, B. Shen, F. Pei, V.B. Kraus, "Effectiveness of low-level laser therapy in patients with knee osteoarthritis: a systematic review and meta-analysis", *Osteoarthritis and cartilage*, 23(9) 1437-1444 (2015).
- [3] H. Jang, H. Lee, "Meta-analysis of pain relief effects by laser irradiation on joint areas", *Photomedicine and laser surgery*, 30(8) 405-417 (2012).
- [4] F. Tascioglu, O. Armagan, Y. Tabak, I. Corapci, C. Oner, "Low power laser treatment in patients with knee osteoarthritis", *Swiss medical weekly*, 134(17-18) 254-258 (2004).
- [5] A.S. Al Rashoud, R.J. Abboud, W. Wang, C. Wigderowitz, "Efficacy of low-level laser therapy applied at acupuncture points in knee osteoarthritis: a randomised double-blind comparative trial", *Physiotherapy*, 100(3) 242-248 (2014).
- [6] A. Alghadir, M.T. Omar, A.B. Al-Askar, N.K. Al-Muteri, "Effect of low-level laser therapy in patients with chronic knee osteoarthritis: a single-blinded randomized clinical study", *Lasers in medical science*, 29(2) 749-755 (2014).
- [7] B. Hegedus, L. Viharos, M. Gervain, M. Galfi, "The effect of low-level laser in knee osteoarthritis: a double-blind, randomized, placebo-controlled trial", *Photomedicine and laser surgery*, 27(4) 577-584 (2009).
- [8] D. Ip, "Does addition of low-level laser therapy (LLLT) in conservative care of knee arthritis successfully postpone the need for joint replacement?", *Lasers in medical science*, 30(9) 2335-2339 (2015).
- [9] T.A. Garcia, R.C.T. Camargo, T.E. Koike, G.A.T. Ozaki, R.C. Castoldi, J.C.S. Camargo Filho, "Histological analysis of the association of low level laser therapy and platelet-rich plasma in regeneration of muscle injury in rats", *Brazilian journal of physical therapy*, 21(6) 425-433 (2017).
- [10] D.R. Helianthi, C. Simadibrata, A. Srilestari, E.R. Wahyudi, R. Hidayat, "Pain Reduction After Laser Acupuncture Treatment in Geriatric Patients with Knee Osteoarthritis: a Randomized Controlled Trial", *Acta medica Indonesiana*, 48(2) 114-121 (2016).
- [11] M. Weber, Personal Communication, in: C. Prodromos (Ed.) 2016.
- [12] J. Araki, M. Jona, H. Eto, N. Aoi, H. Kato, H. Suga, K. Doi, Y. Yatomi, K. Yoshimura, "Optimized preparation method of platelet-concentrated plasma and noncoagulating platelet-derived factor concentrates: maximization of platelet concentration and removal of fibrinogen", *Tissue engineering. Part C, Methods*, 18(3) 176-185 (2012).